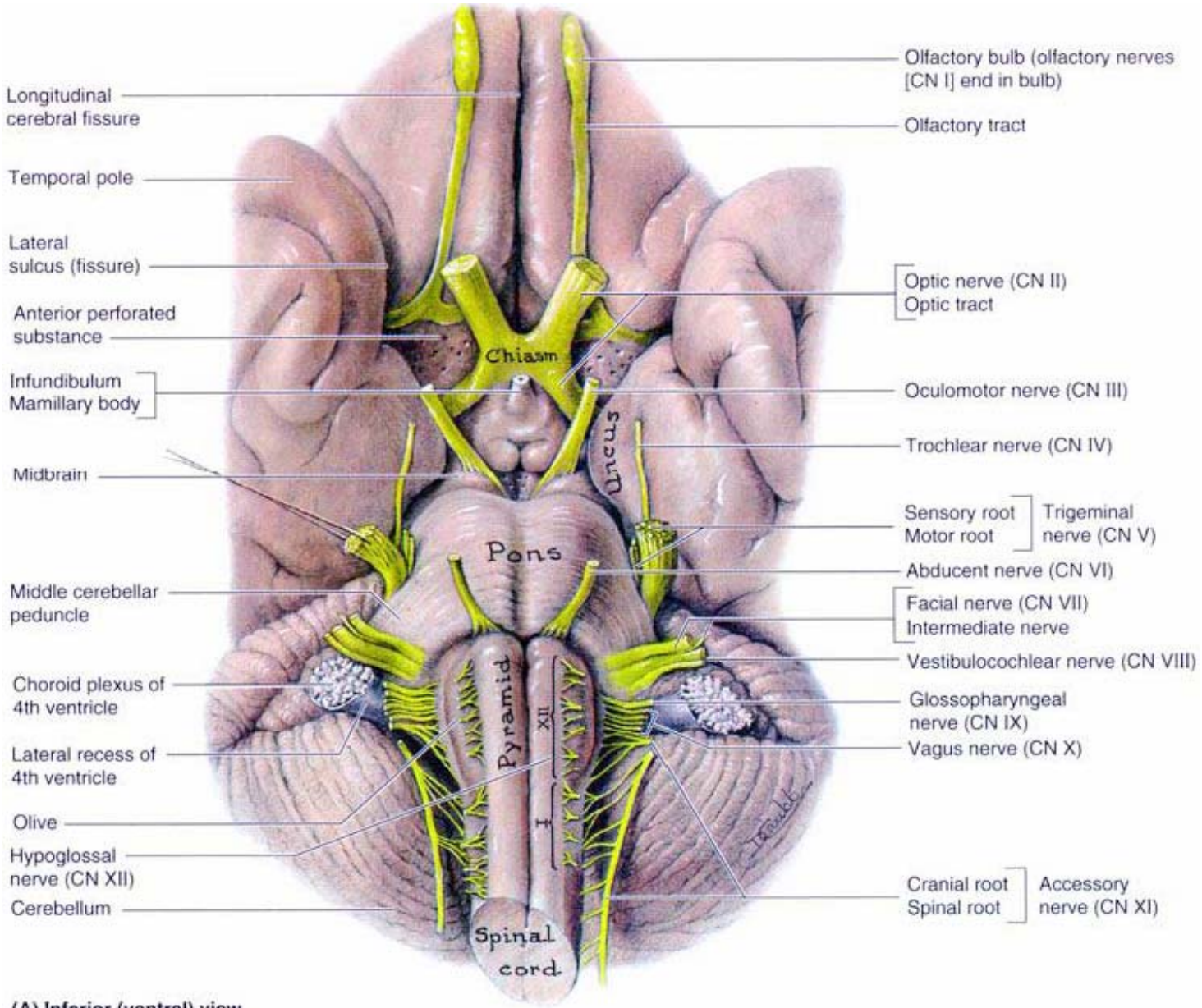
Cranial Nerves

Olfactory Nerve (CNI)

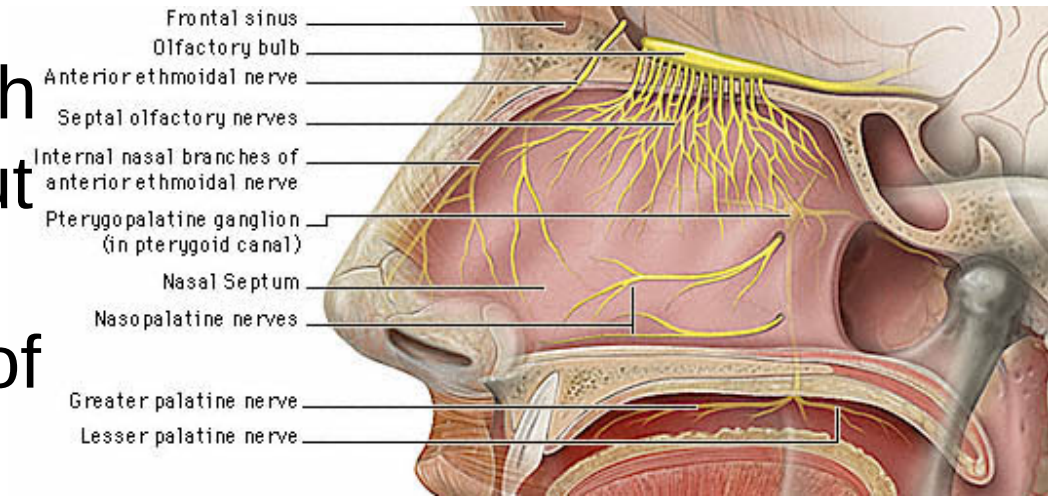
Olfactory Nerve (CNI)



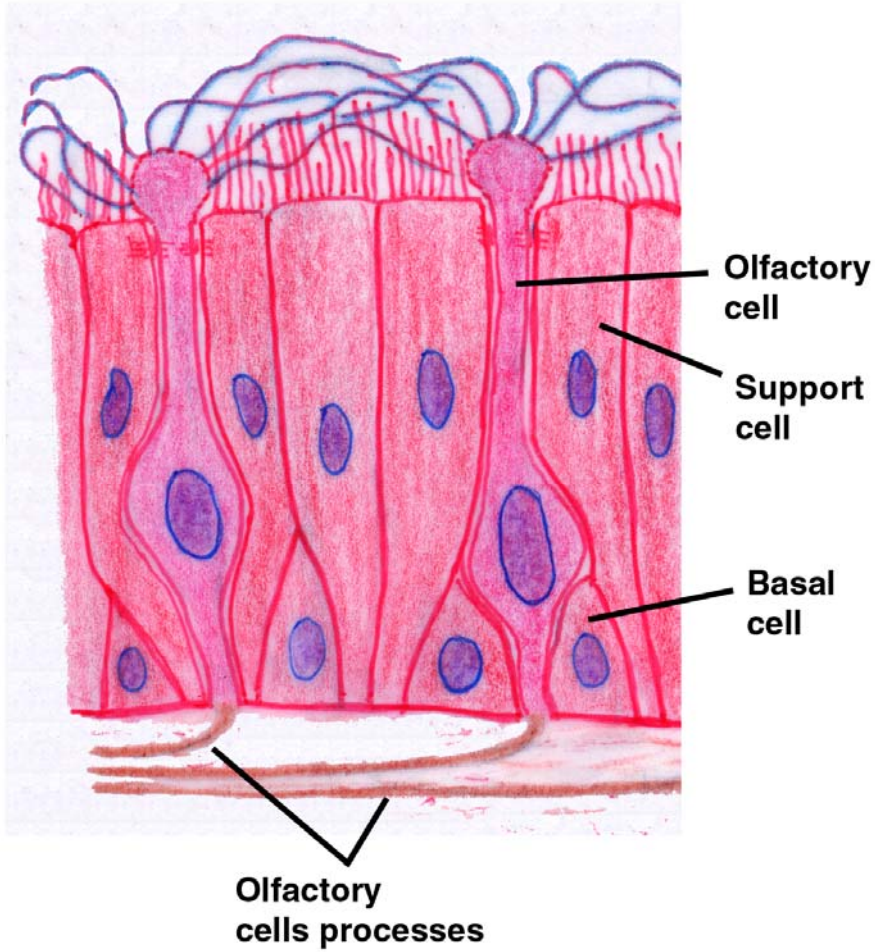
(A) Inferior (ventral) view

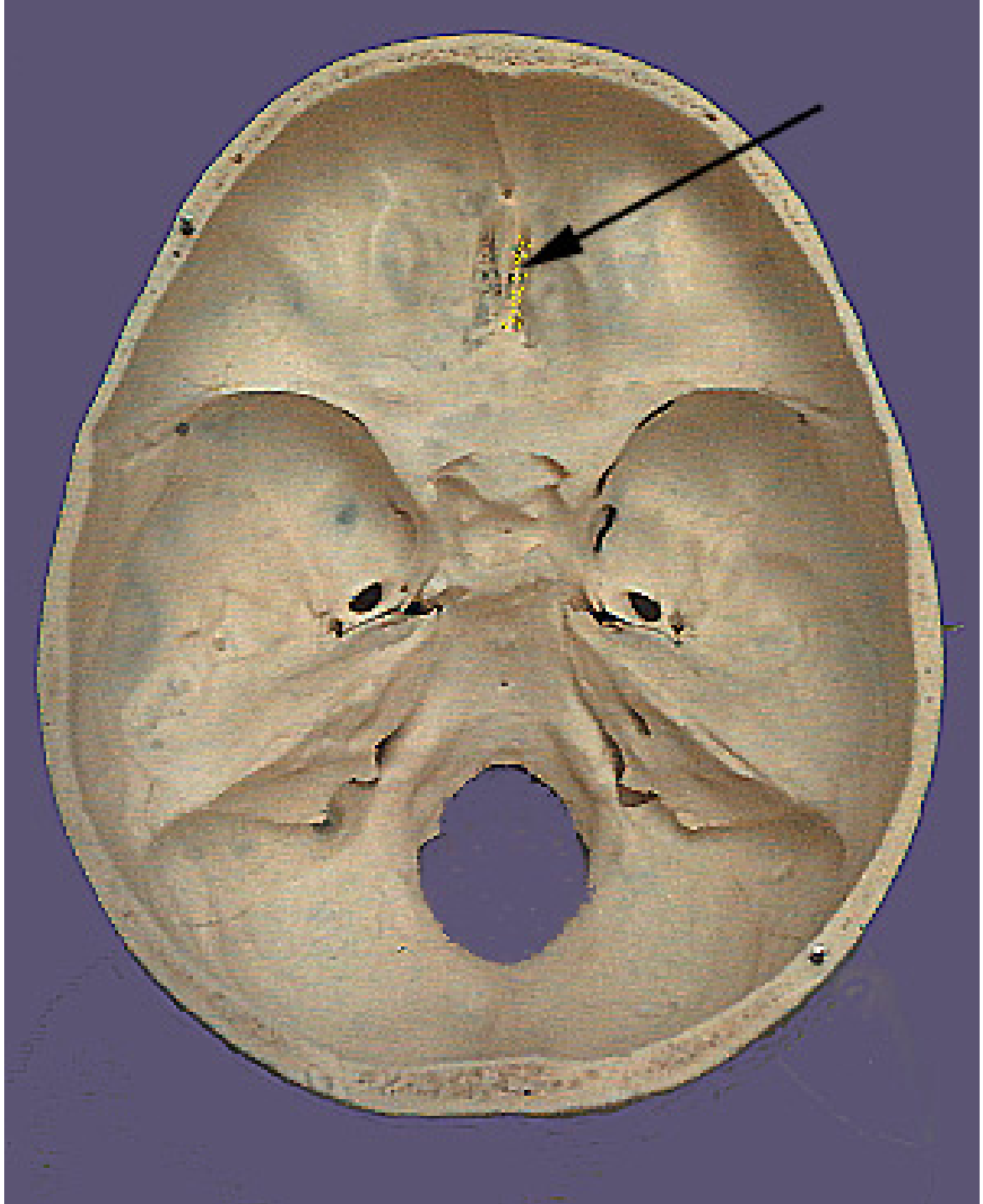
Olfactory Nerve (CN I)

- The receptors cells for smell form a patch of epithelium of about 5cm^2(olfactory mucosa) in the roof of the nasal cavity.
- It covers part of the superior nasal concha and septum.



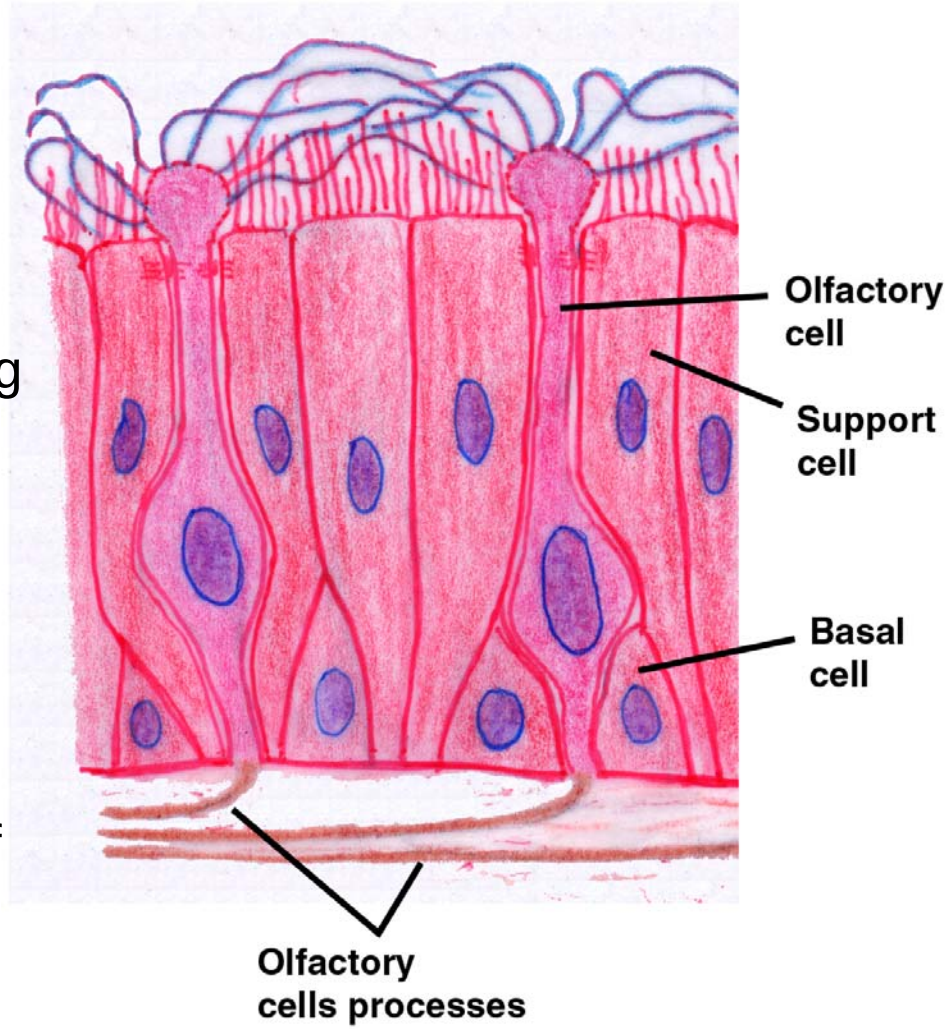
- Olfactory receptor cells are **neurons with a modified dendrite** consisting of a swollen tip bearing 10-20 **cilia called olfactory hairs**.
- The hairs are immobile and have **binding sites for odor molecules**
- The basal end of the cell tapers to become an axon.
- These **axons collect into small fascicles** that leave the nasal cavity through pores (**cribriform foramina**) in the ethmoid bone
- Collectively, **the fascicles are regarded as cranial nerve I** (olfactory nerve)



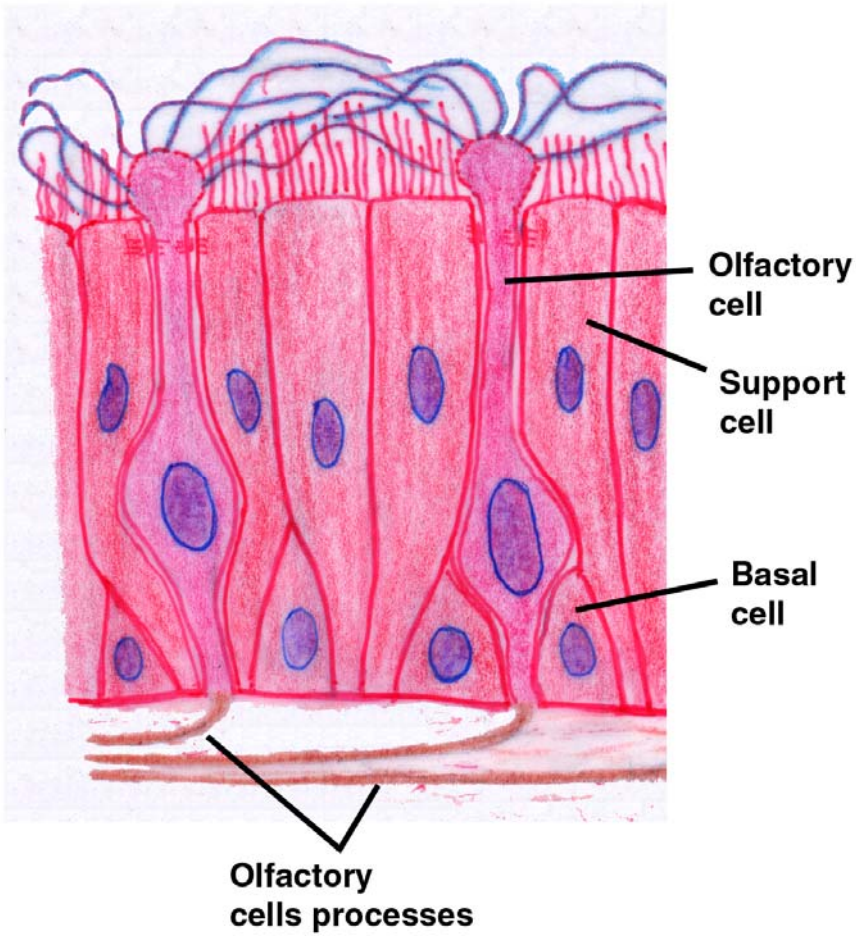


fascicles emerging through the cribriform foramina

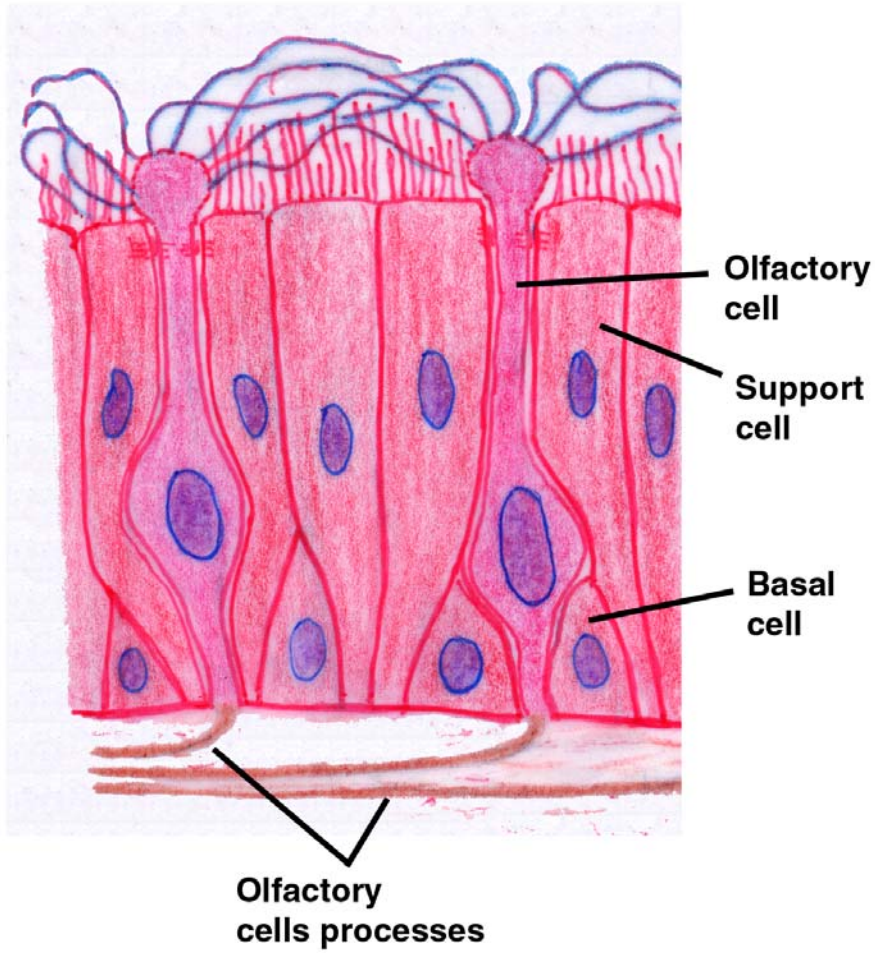
- The **olfactory cells** (**OC**) are a form of bipolar neuron that serve as transducers of chemical sensations into neural signals.
- They are **the only neurons** in the body directly **exposed to the external environment.**
- Molecules with a "scent" bind to the surface of these cells and in so doing the modify the cell membrane's charge characteristics, sending a signal via a long axon back to the brain.
- The axons of these neurons are bundled together to form the **olfactory nerve**, which is then routed through the overlying bone of the nose (cribriform plate) into the olfactory lobe of the brain.



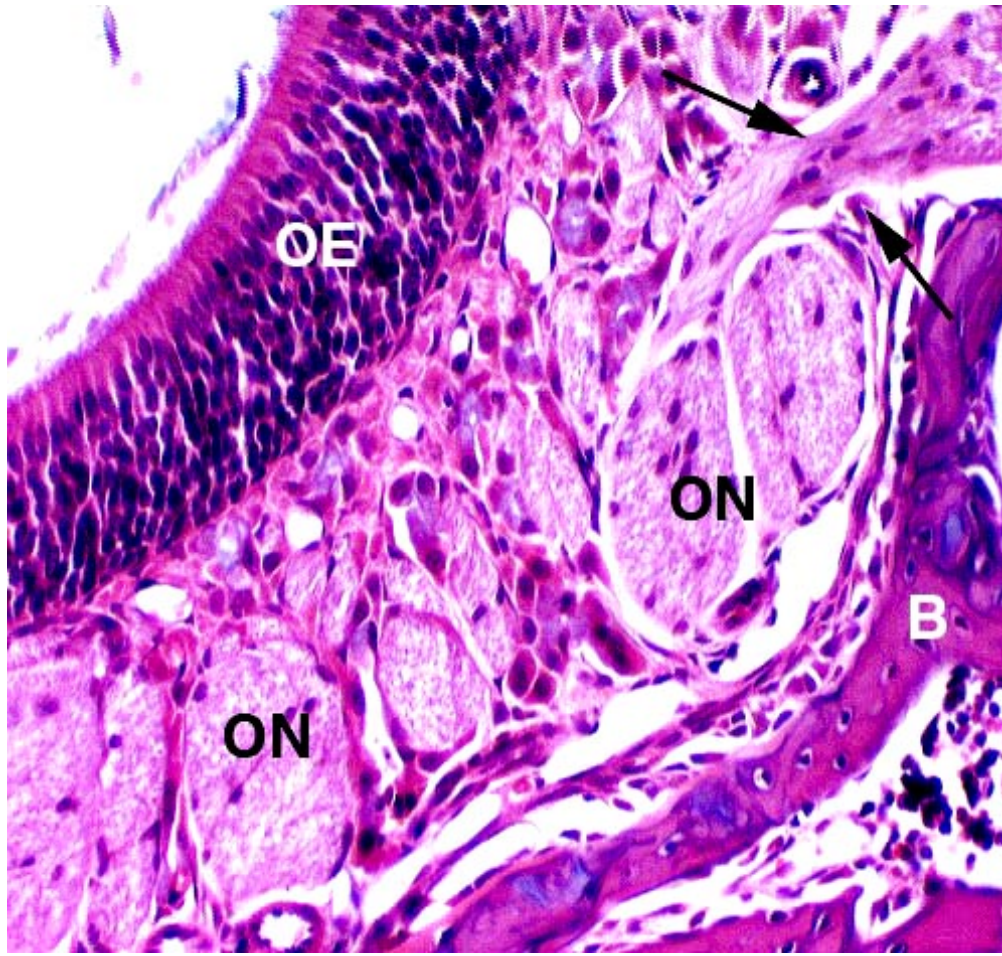
- There are other cell types present in olfactory epithelium.
- One is the conventional **supporting cell** (**SC**) which provides both physical and nutritive support for the neural elements; it's ciliated.
- The second is the so-called **basal cell** (**BC**) that appears to be a glial element.



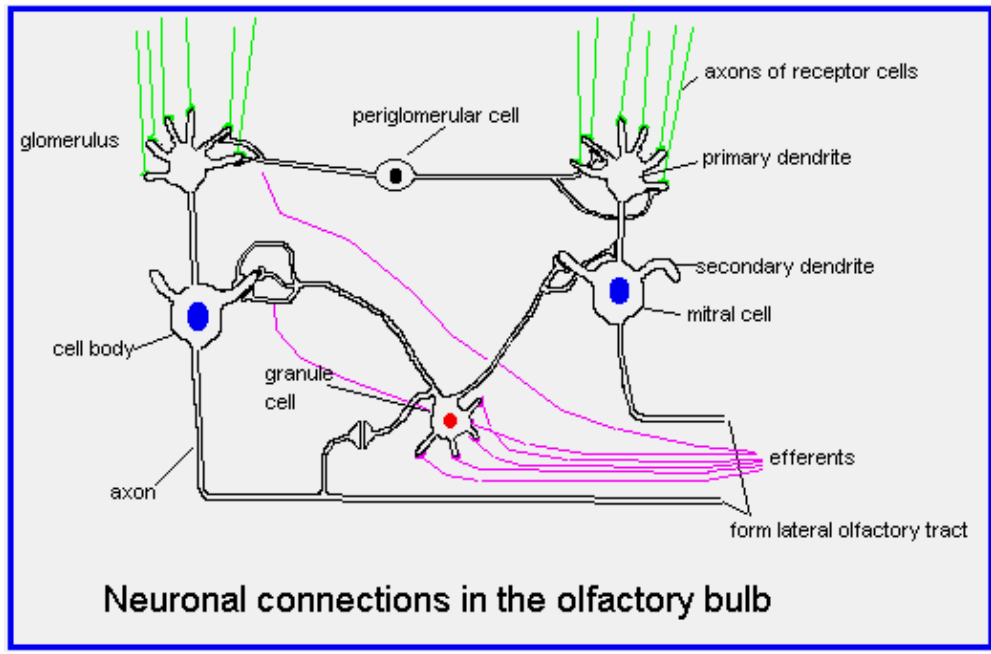
- Olfactory cells have a life span of approximately 60 days
- They are continually replaced by the differentiation of the basal cells into new olfactory cells



- The axons of the bipolar olfactory cells are bundled together to form fascicles.
- These are collected and become the **olfactory nerve** (ON).
- In the image you see several such bundles, and also the place where they're collecting together and being channeled through the bone (**B**). The fibers have come from the region of olfactory epithelium (**OE**) at top left.

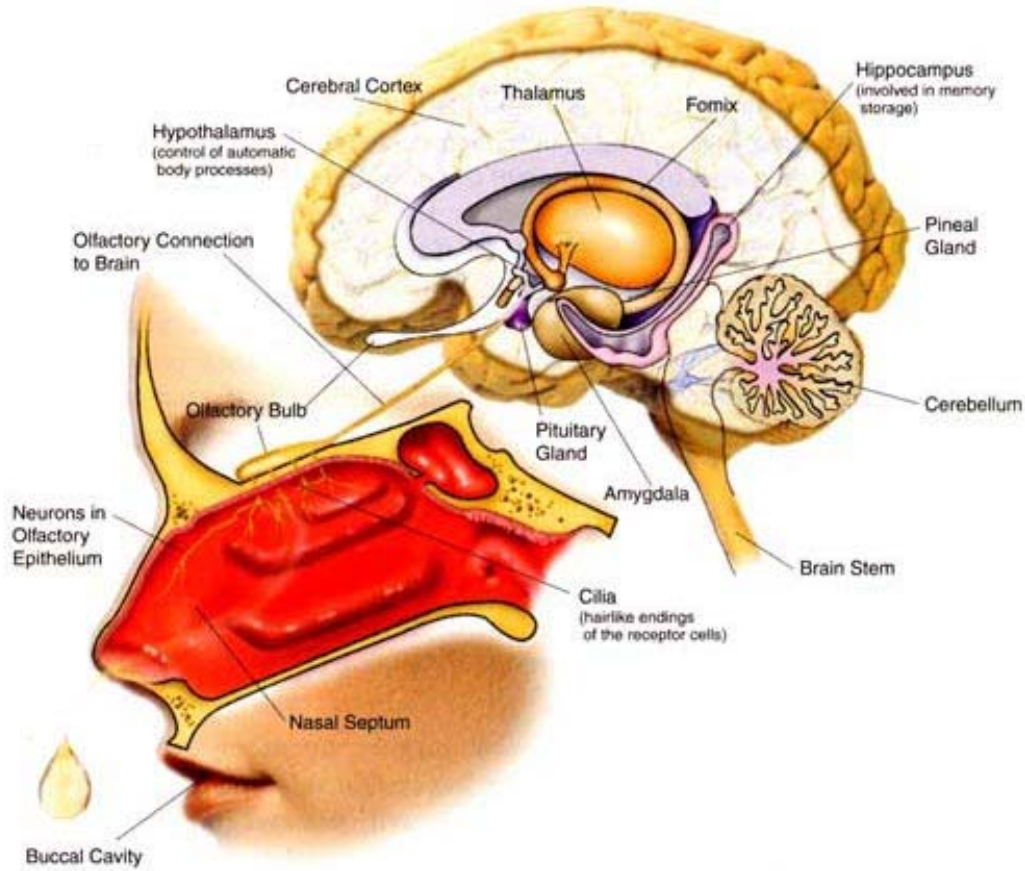


- After passing through the cribriform plate, they enter olfactory bulb where they synapse with neurons called **mitral cells** and **tuft cells**
- **Granule cells** receive signals from the cortex and **are inhibitory** to the mitral cells (causing adaptation)
  - can change odor quality and significance under different conditions
- The axons from the mitral and tuft cells from bundles called the **olfactory tract**



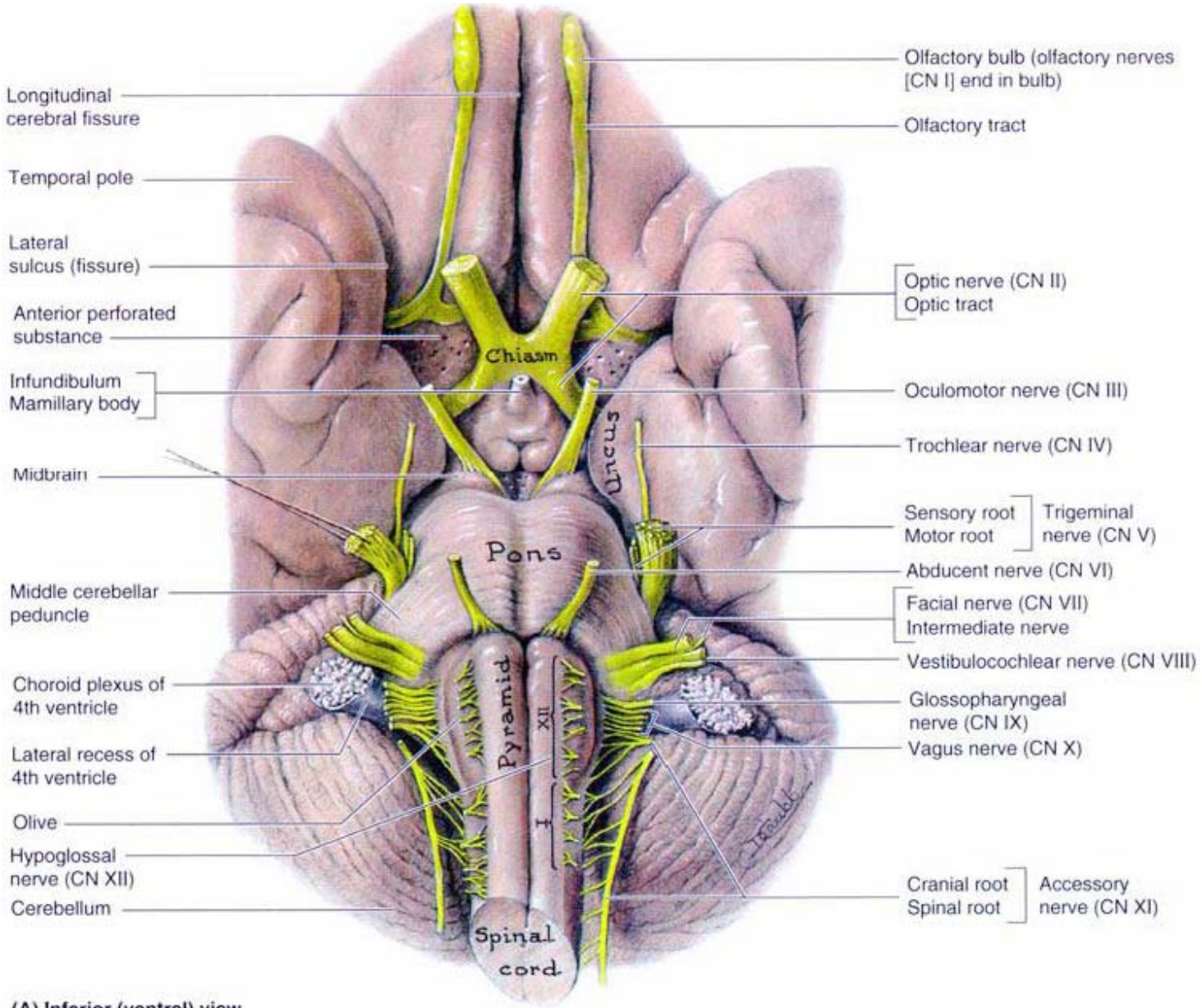
Neuronal connections in the olfactory bulb

- The tracts follow a pathway **leading to the** medial side of the **temporal lobe**
- Input goes to the **amygdala and hypothalamus** which **triggers emotional and visceral responses.**
- Olfactory signals differ from other sensory inputs in that they **reach the cerebral cortex without passing through the thalamus**



Optic Nerve (CN II)

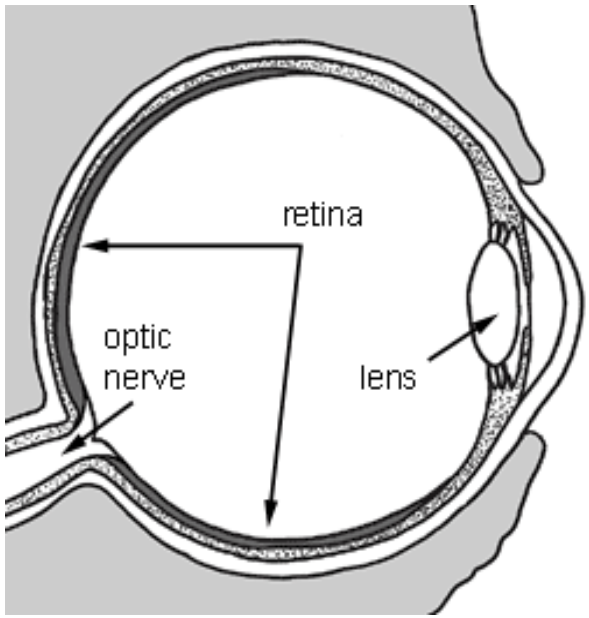
Optic Nerve (CN II)

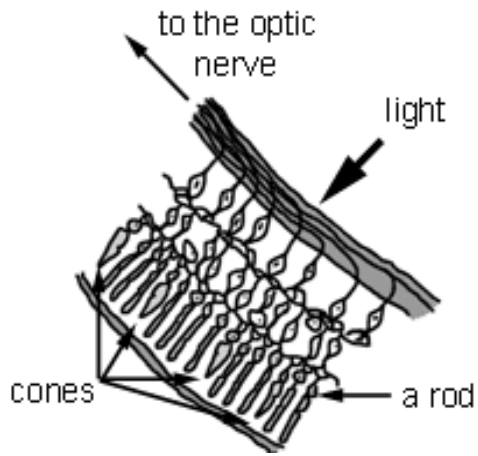


(A) Inferior (ventral) view

Optic Nerve (CN II)

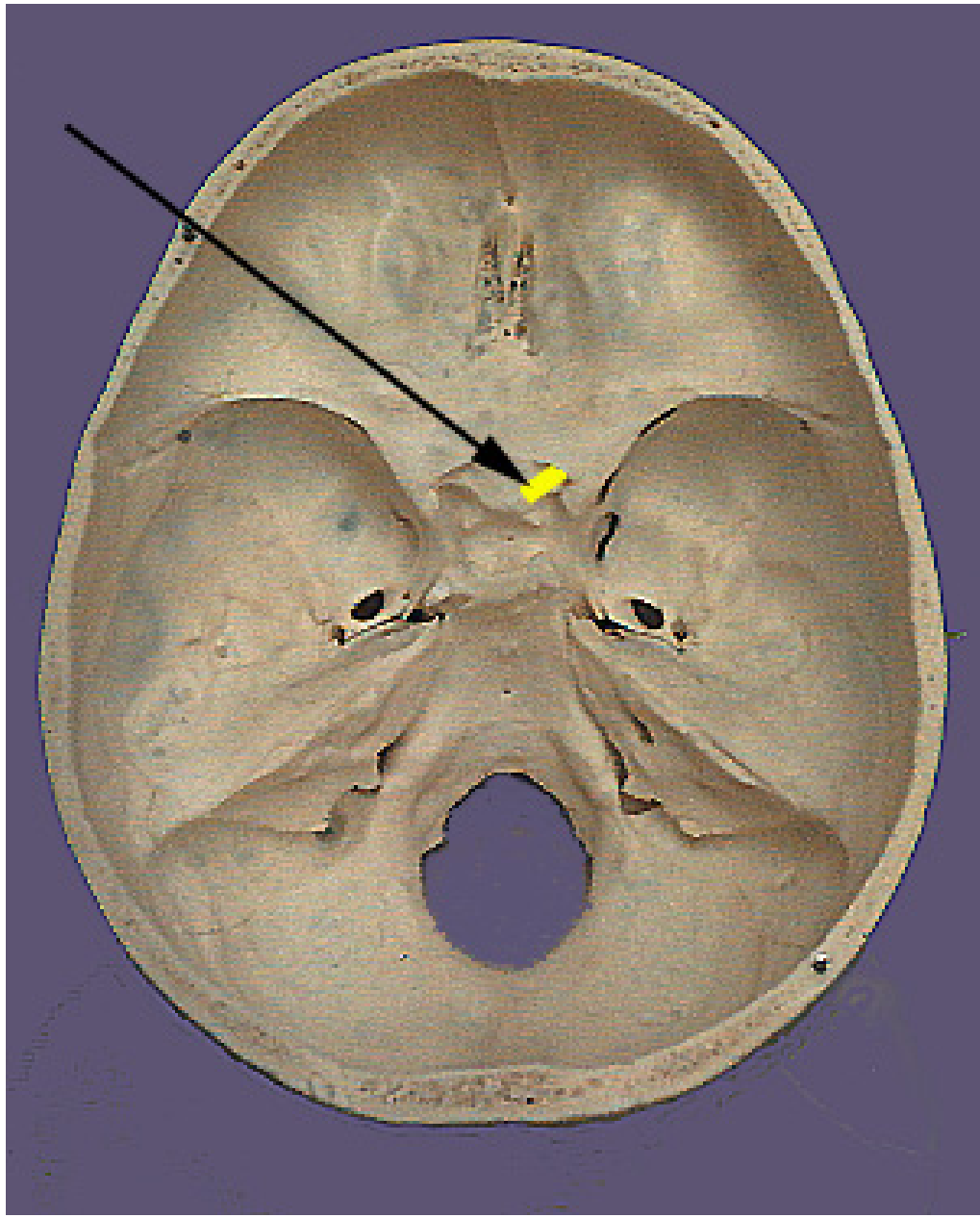
- originates from the bipolar cells of the retina which are connected to the specialized receptors in the retina (rod and cone cells).
- Electrical signals generated by the bipolar cells are transmitted to the brain through the optic nerve



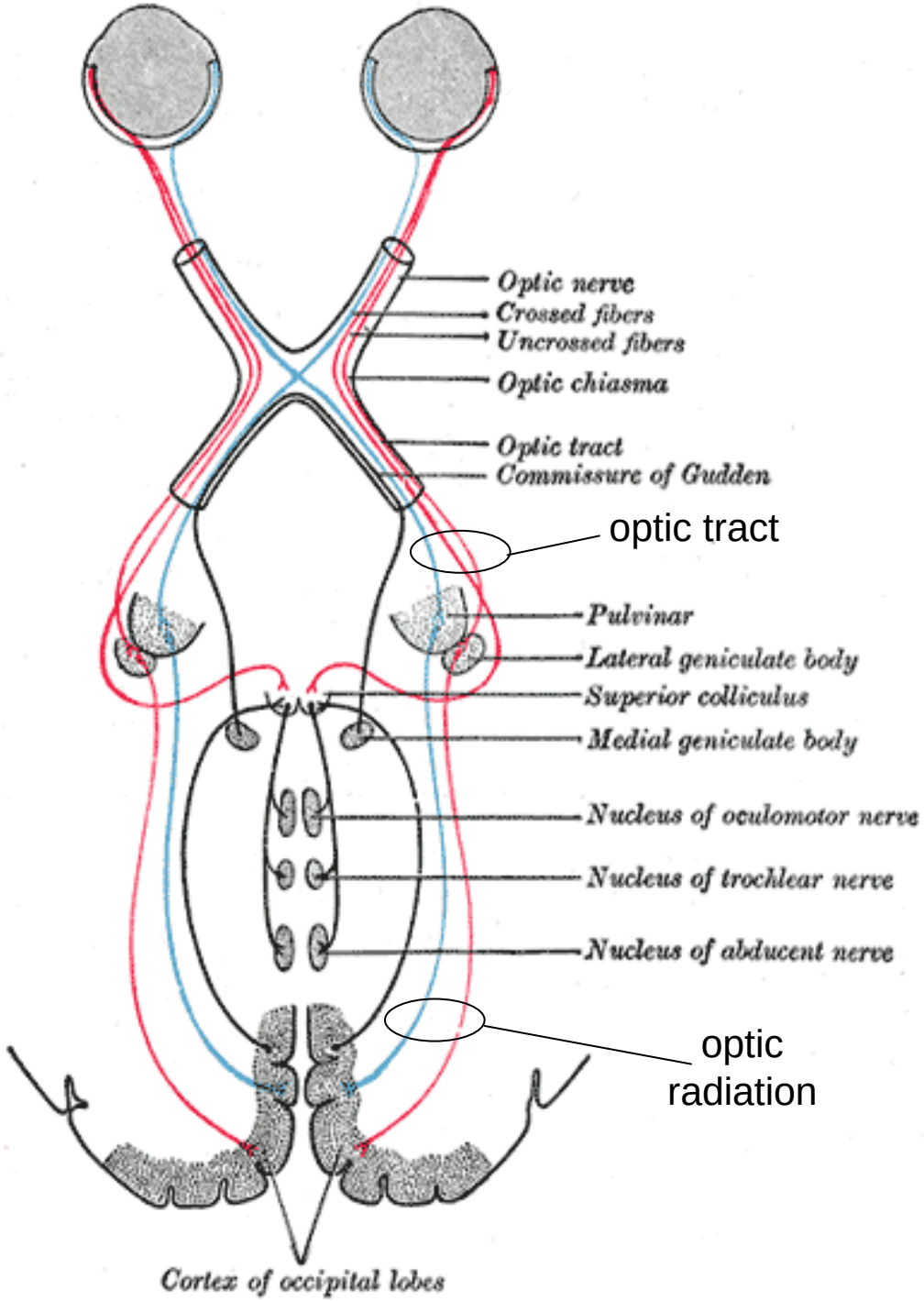


Optic Nerve (CN II)

- The optic nerve exits the back of the eye in the orbit and enters the **optic canal** and exits into the cranium.
- It enters the central nervous system at the **optic chiasm** (crossing) where the nerve fibers become the **optic tract** just prior to entering the brain.



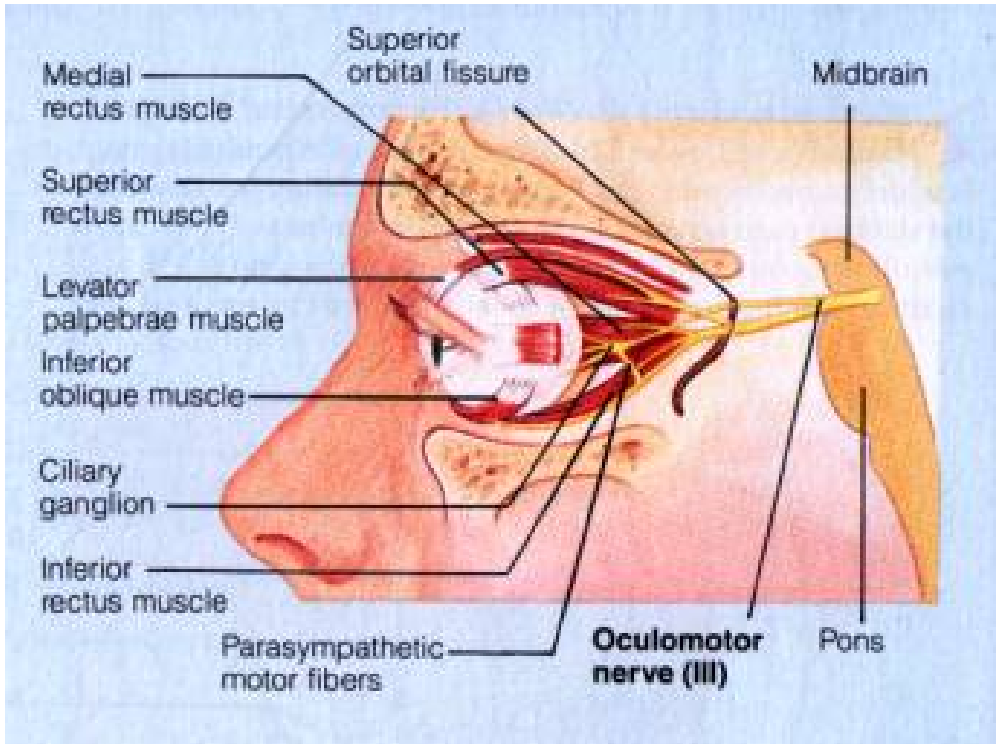
- Most of the axons of the optic nerve terminate in the **lateral geniculate nucleus** (*primary visual processing unit of the thalamus, integrates messages from two eyes into a single picture*)
- information is then relayed to the primary visual cortex in the occipital lobe and **superior colliculus** (*eye movement)* from where spinotectal reflexes are mediated.



Oculomotor Nerve (CN III)

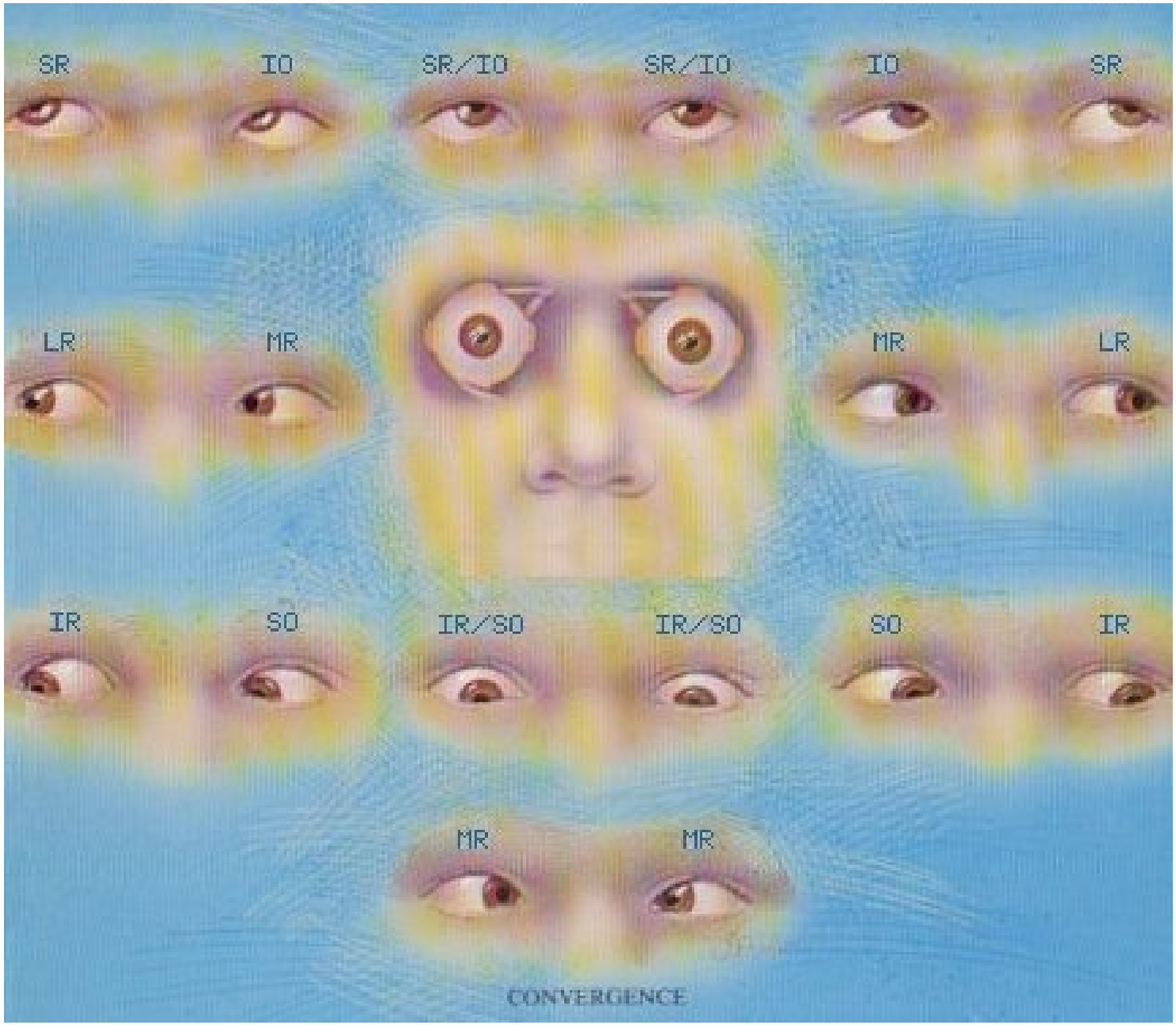
Oculomotor Nerve (CN III)

- Is classified as a motor nerve innervating all the extra ocular muscles **except the superior oblique muscle** (*supplied by nerve IV*) and the **lateral rectus muscle** (*supplied by nerve VI*).
- Innervation of the four extraocular muscles causes the eye to turn upward, downward and medially. (superior rectus, inferior rectus, medial rectus, inferior oblique)
- Innervates, also, the levator palpabre superioris



Origin: Midbrain

Cranial passage: superior orbital fissure


SR
IO
SR/IO
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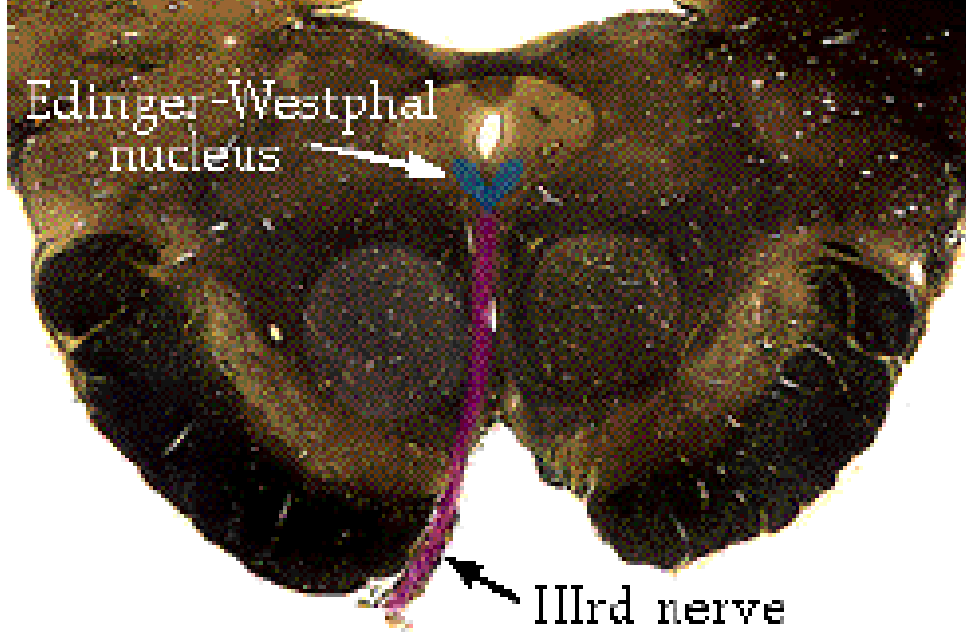
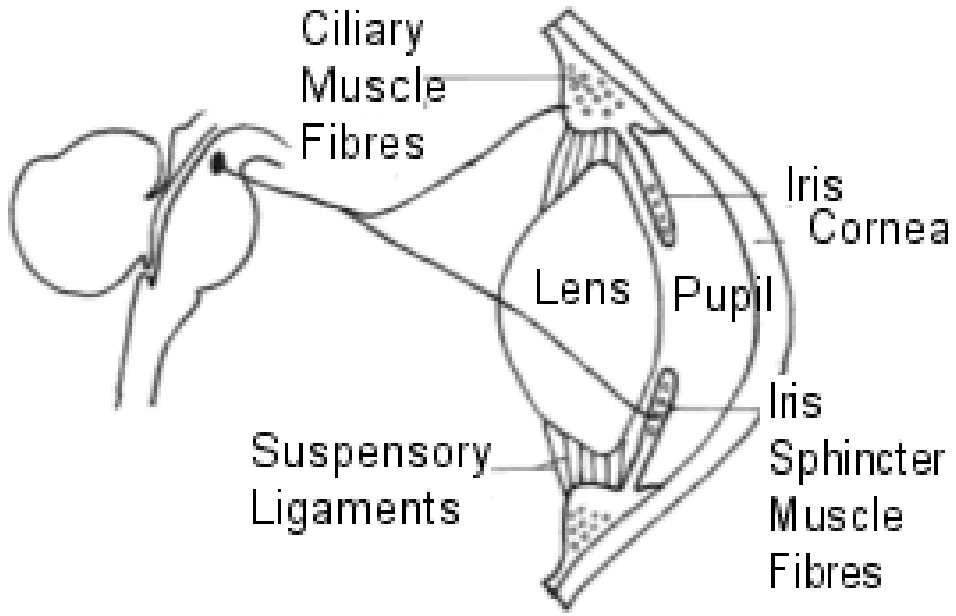
CONVERGENCE

Edinger-Westphal Nucleus

- source of the **parasympathetics** to the eye, which constrict the pupil and accommodate the lens.
- It is located just inside the oculomotor nuclei.
- The fibers travel in the IIIrd nerve, so damage to that nerve will also produce a dilated pupil.



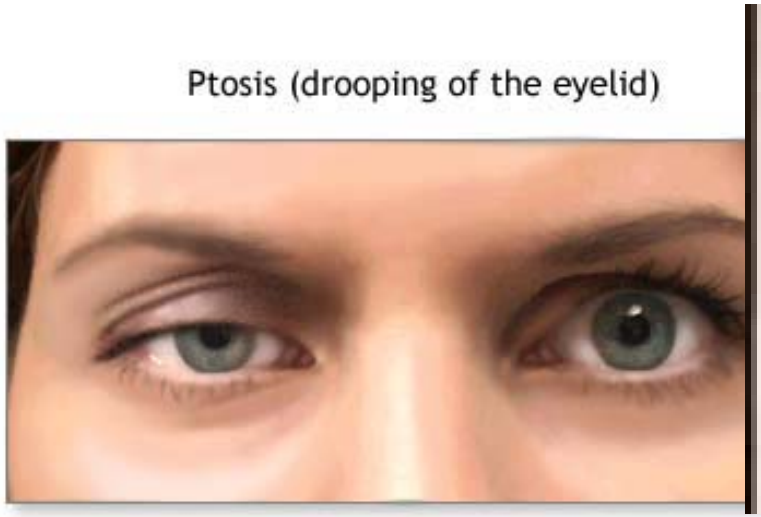


Clinical Pearl

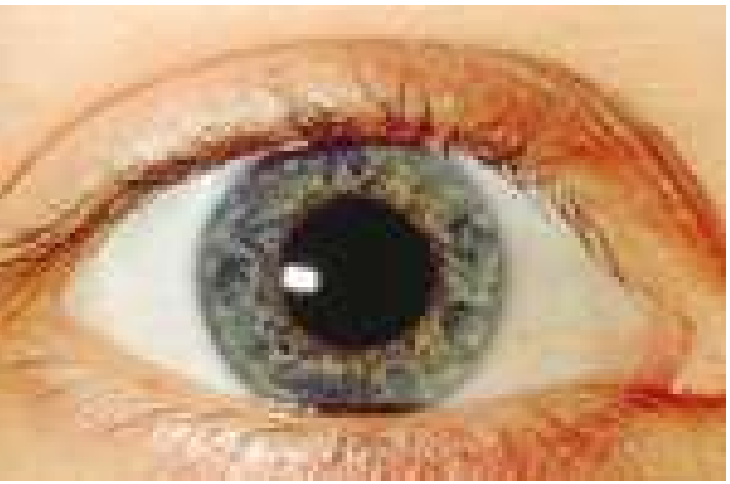
- the eye drops that you are given at the ophthomologist's office are an **acetylcholine antagonist** (blocker) so they **inhibit the actions of the parasympathetic system.**
- As a result your **eyes are dilated**, so the physician can look inside clearly.
- As a side effect, you **cannot accommodate** your lens (focus on close objects) which is why you can't read while you are sitting in the waiting room.

Damage to Oculomotor Nerve

- **Lateral strabismus**, as medial rectus is paralysed and the lateral rectus is unopposed;
- **Diplopia**, double-vision as one of the eye deviates from the midline;
- Inability to **move** the eye **medially** or **vertically**;
- **Ptosis** as the ipsilateral levator palpebrae superioris is paralysed;
- **Mydriasis** (dilated pupil of affected side) and **unresponsiveness to light** as the sphincter pupillae is non-functional and the dilator pupillae is unopposed;
- Inability for the affected eye to **focus on near objects** as the ciliary muscles have also been paralysed.



Lateral strabismus
(misaligned eye)



Mydriasis (dilated pupil)

Diplopia (double
vision)

Trochlear Nerve (CN IV)

Trochlear Nerve (CN IV)

- supplies the **superior oblique muscle**.
- Its cell bodies are **located** in the **contralateral trochlear nucleus**.

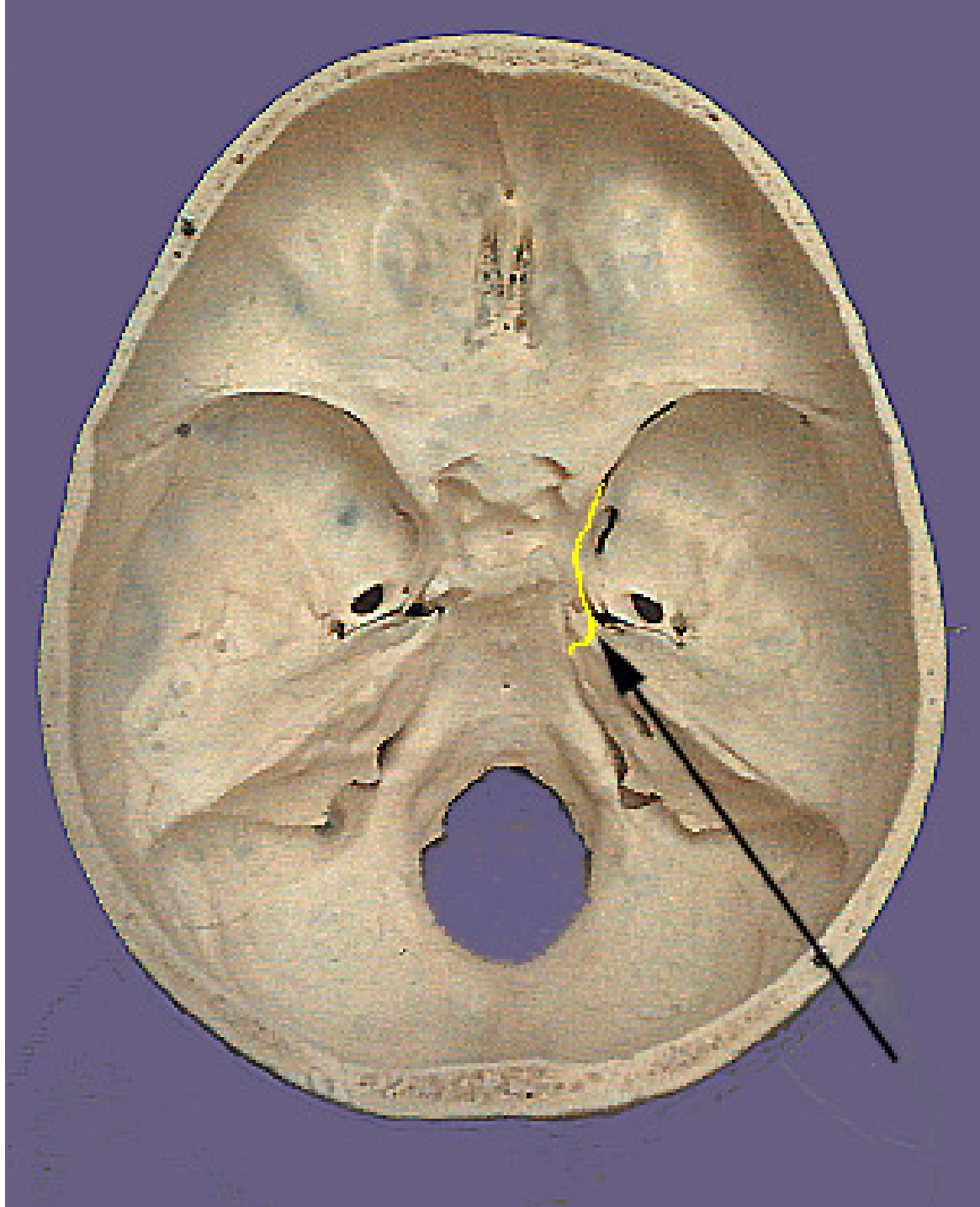
The trochlear nerve is **unique** in that:

- It is the only cranial nerve attached to the **dorsal aspect** of the brainstem;
- It is the only one to **originate completely** from the **contralateral nucleus**.

Origin: midbrain

termination: superior oblique

Cranial passage: superior orbital fissure



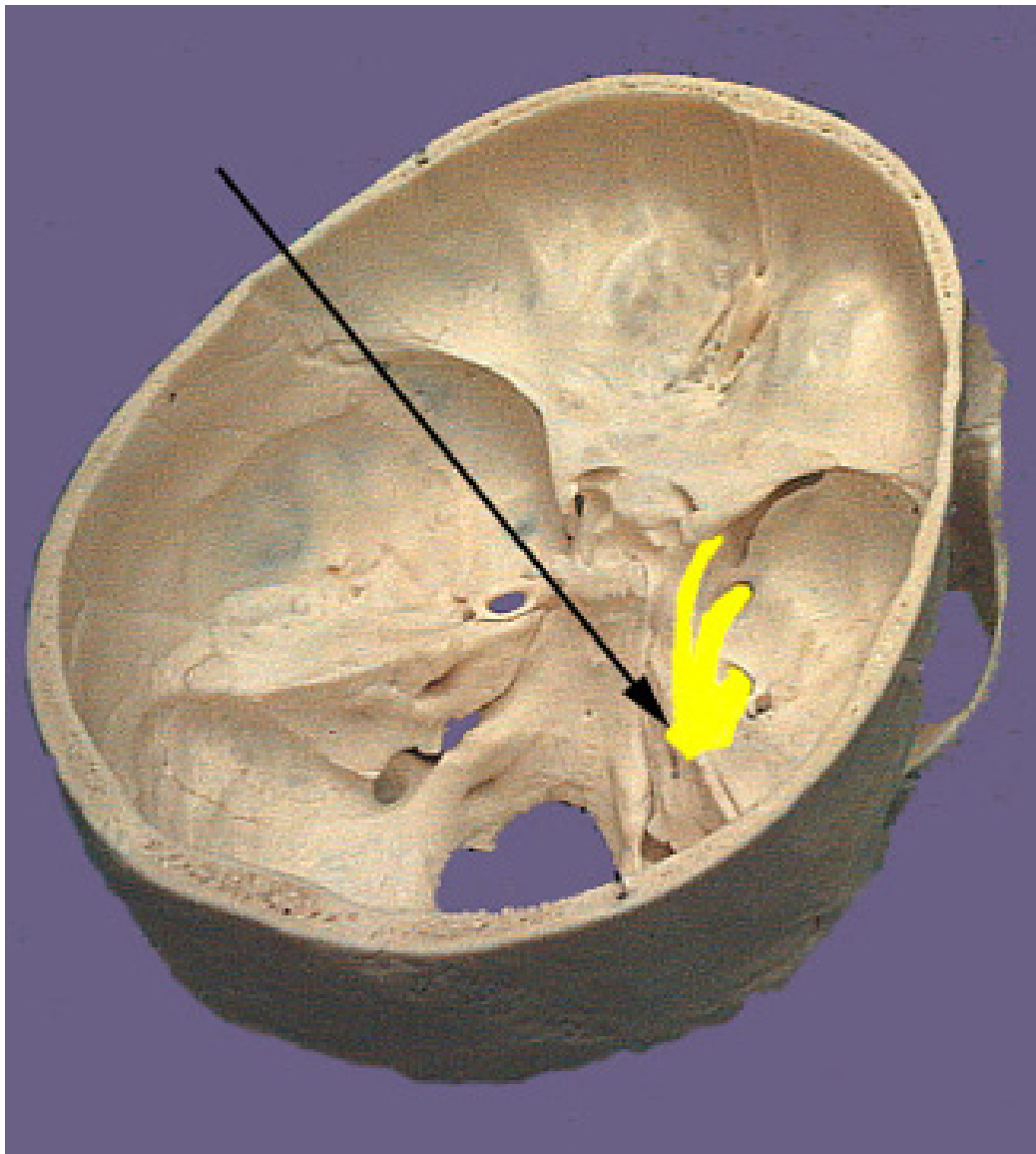
Clinical Significance of the Trochlear Nerve

- Damage to the trochlear nerve result in **much less** drastic and noticeable deficits than damage to the oculomotor or abducens nerves.
- The **superior oblique muscle** helps to move the eye **downward** and **medially (inferolateral)**.
- Attempted movements in these directions (e.g., reading or walking down stairs) may cause **diplopia**.
- Eye points superolaterally

Trigeminal Nerve (CN V)

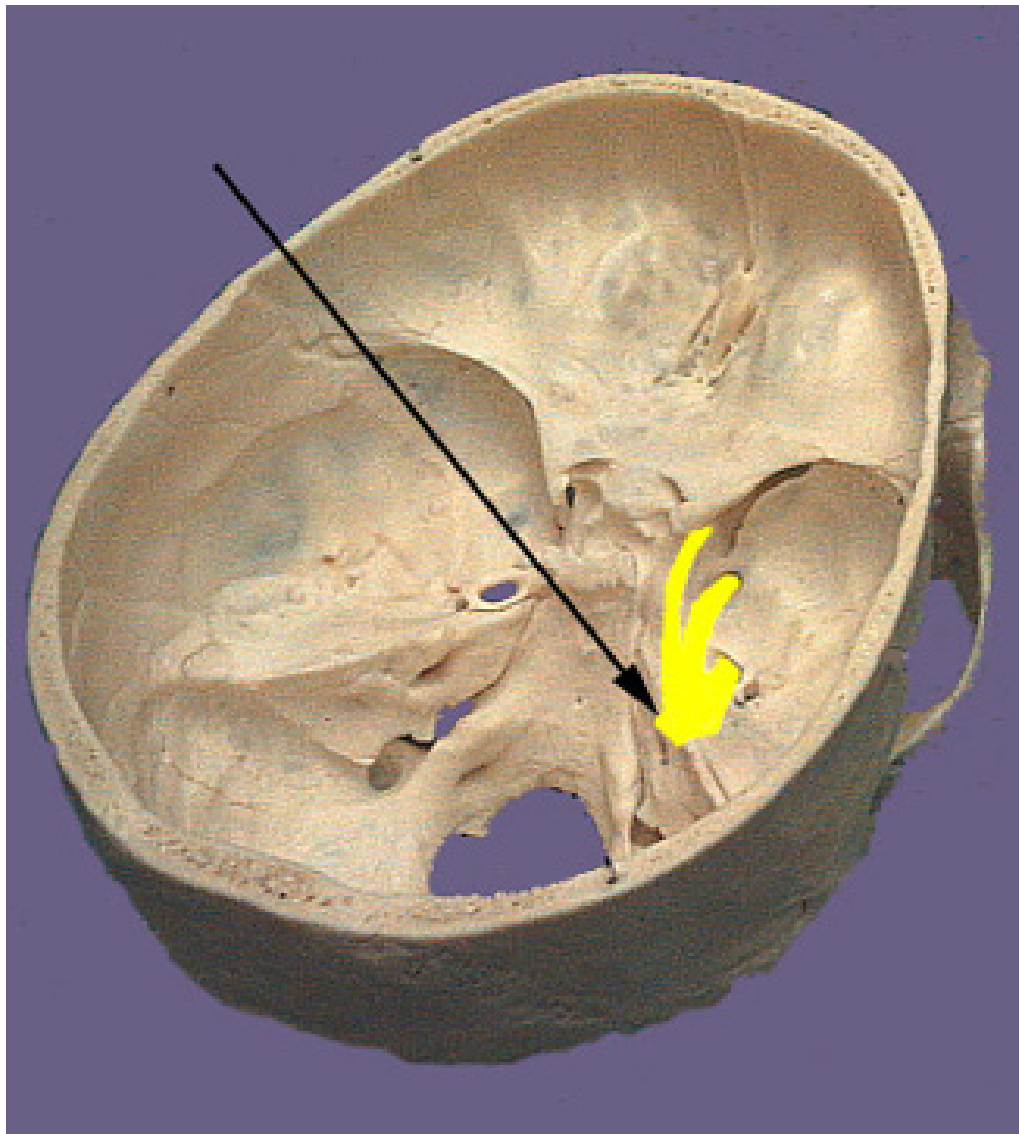
Trigeminal Nerve (CN V)

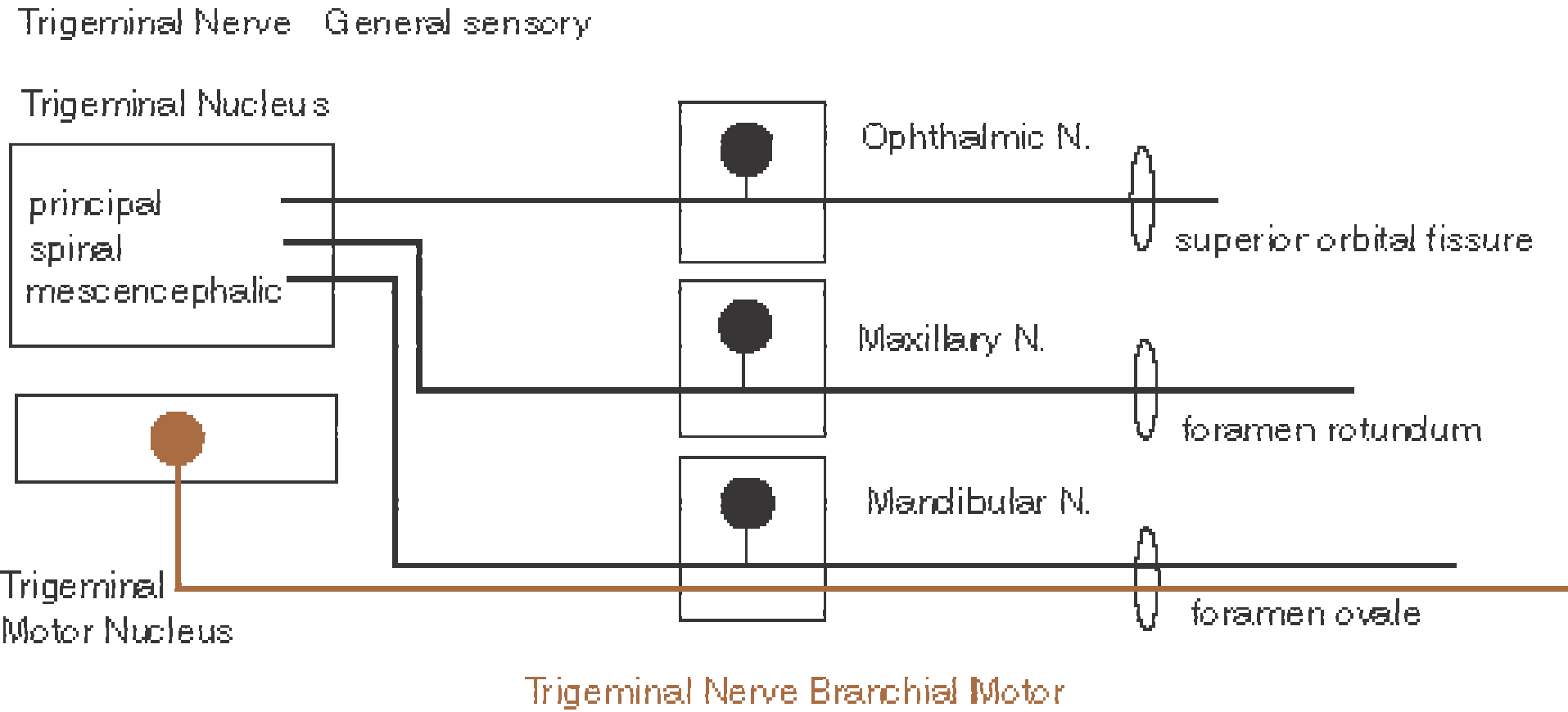
- is a mixed nerve that consists primarily of sensory neurons.
- The trigeminal nerve lies in the floor of the middle cranial fossa, on the petrous temporal bone.
- It forms the trigeminal ganglion from which its three branches diverge.
  - The trigeminal ganglion corresponds to the dorsal root ganglion of a spinal nerve.



Trigeminal Nerve (CN V)

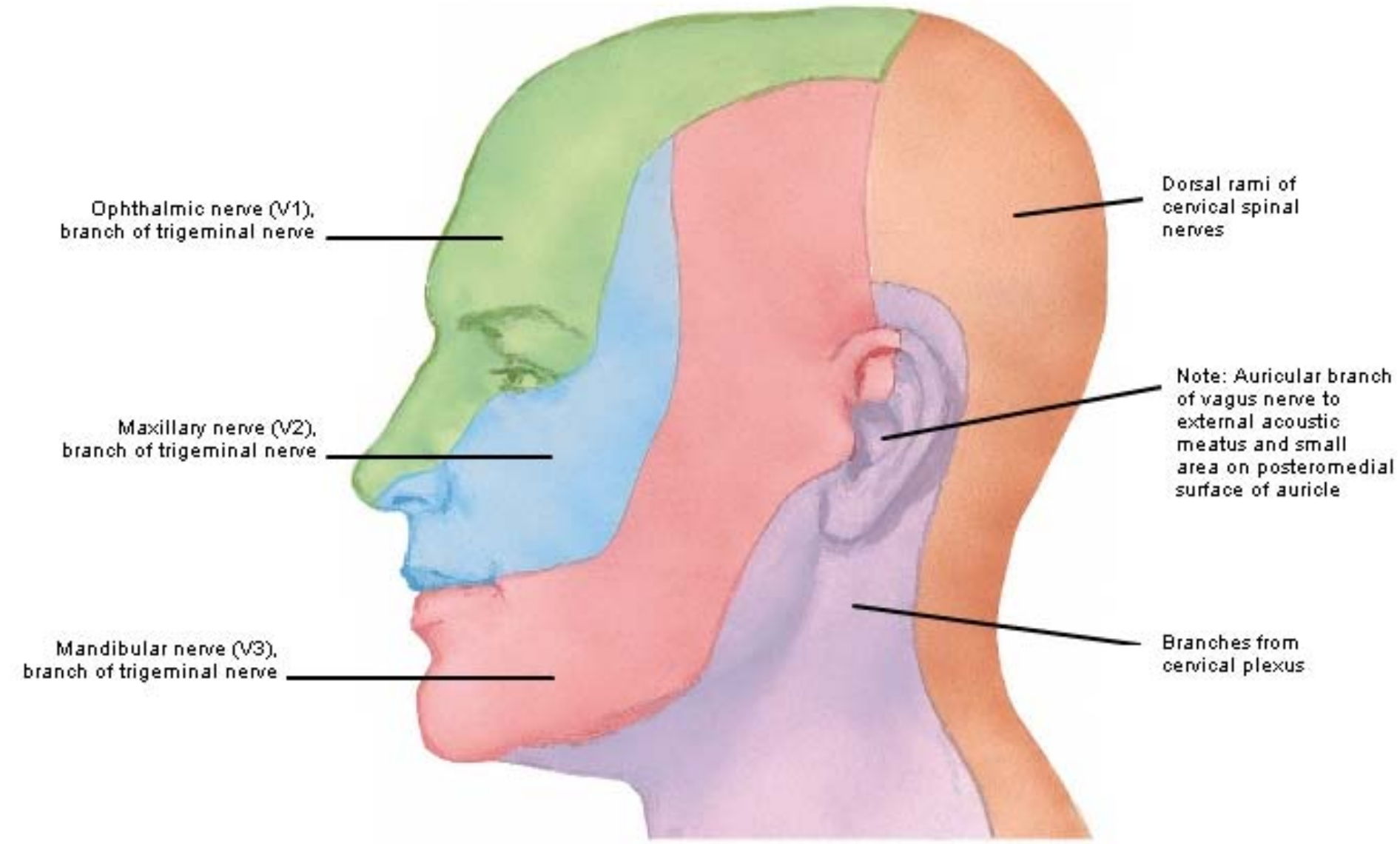
- Three major branches emerge from the trigeminal ganglion and each branch innervates a different dermatome.
- The **mandibular nerve (V^3)** passes out of the skull through the **foramen ovale**.
- The **maxillary nerve (V^2)** passes along the lateral wall of the cavernous sinus to leave the skull through the **foramen rotundum** in the sphenoid bone.
- The **ophthalmic nerve (V^1)** passes along the side of the cavernous sinus to pass into the orbit through the **superior orbital fissure.**





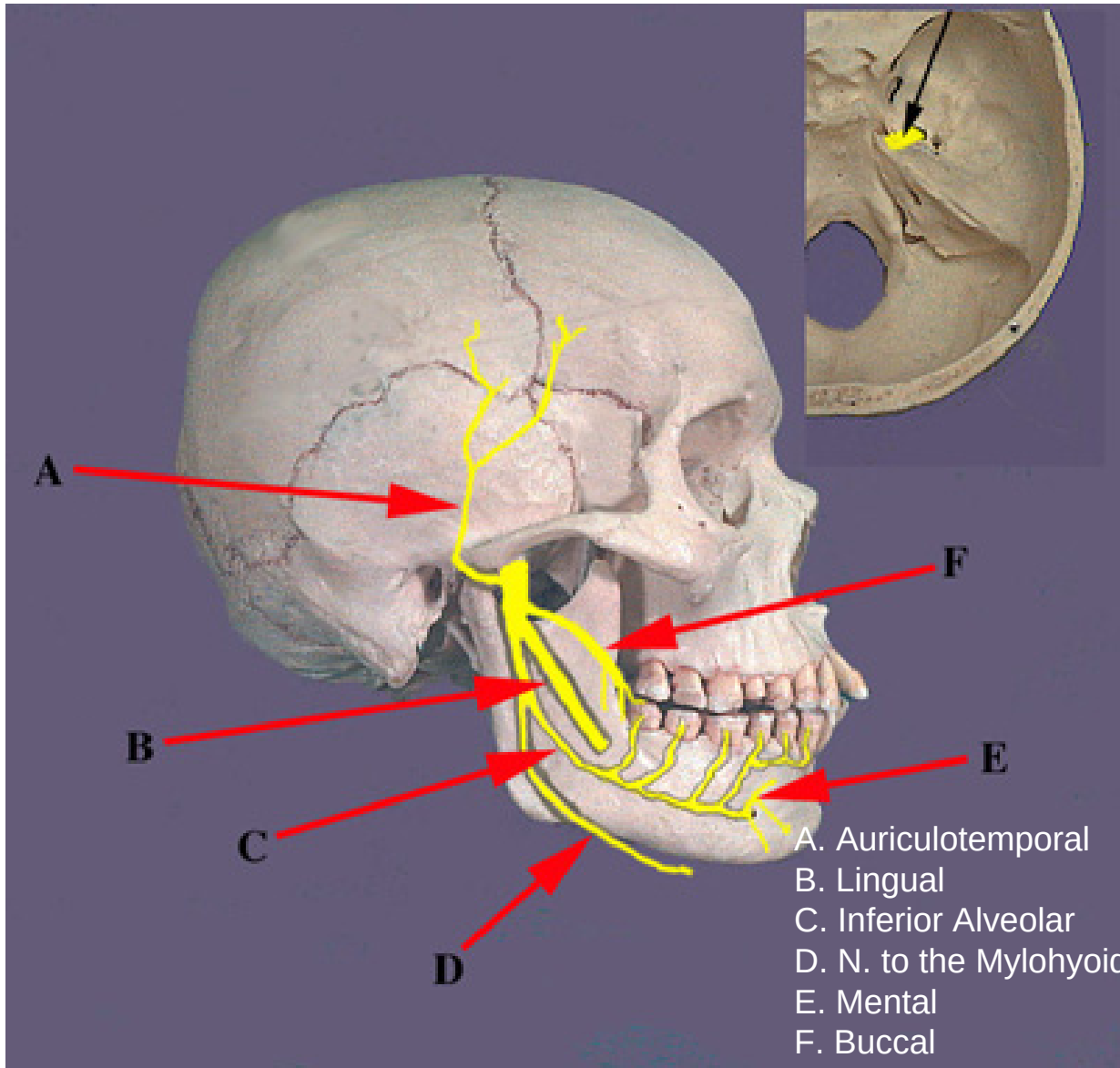
Trigeminal Nerve Branchial Motor

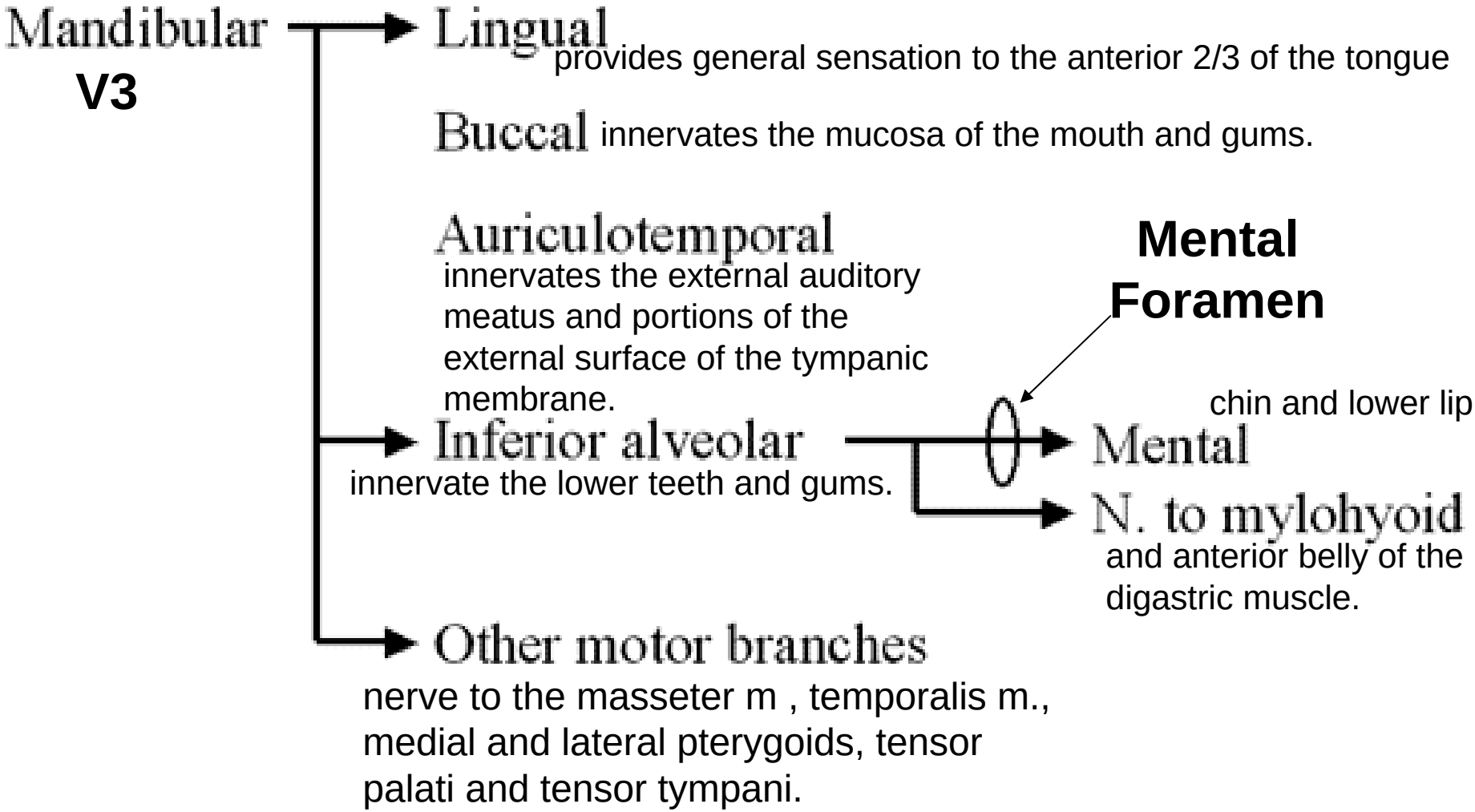
Dermatome of Head & Neck


Ophthalmic nerve (V1), branch of trigeminal nerve
Maxillary nerve (V2), branch of trigeminal nerve
Mandibular nerve (V3), branch of trigeminal nerve
Dorsal rami of cervical spinal nerves
Note: Auricular branch of vagus nerve to external acoustic meatus and small area on posteromedial surface of auricle
Branches from cervical plexus

Mandibular Nerve

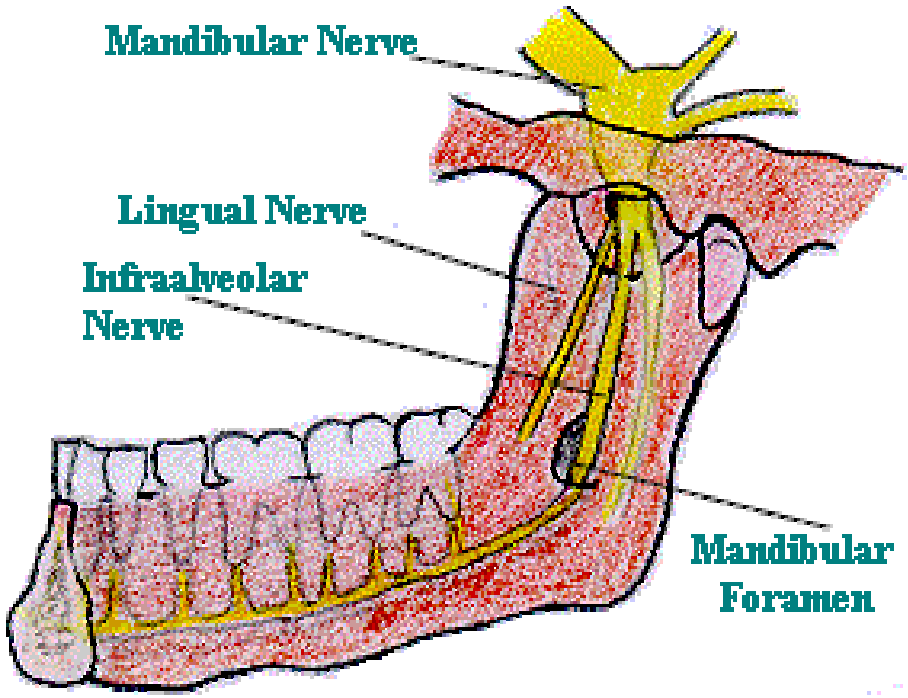
- emerges from the skull through the **foramen ovale** and divides into two anterior sensory and posterior motor trunks.
- supplies sensation to all teeth, skin of the chin and skin and mucous membrane of lower lip on ipsilateral side of mandible.




Mandibular
V3
Lingual
provides general sensation to the anterior 2/3 of the tongue
Buccal
innervates the mucosa of the mouth and gums.
Auriculotemporal
innervates the external auditory meatus and portions of the external surface of the tympanic membrane.
Mental Foramen
chin and lower lip
Inferior alveolar
innervate the lower teeth and gums.
Mental
N. to mylohyoid
and anterior belly of the digastric muscle.
Other motor branches
nerve to the masseter m , temporalis m., medial and lateral pterygoids, tensor palati and tensor tympani.

Lingual Nerve

- A sensory branch of the MANDIBULAR NERVE
- carries general afferent fibers from the anterior two-thirds of the tongue, the floor of the mouth, and the mandibular gingivae.



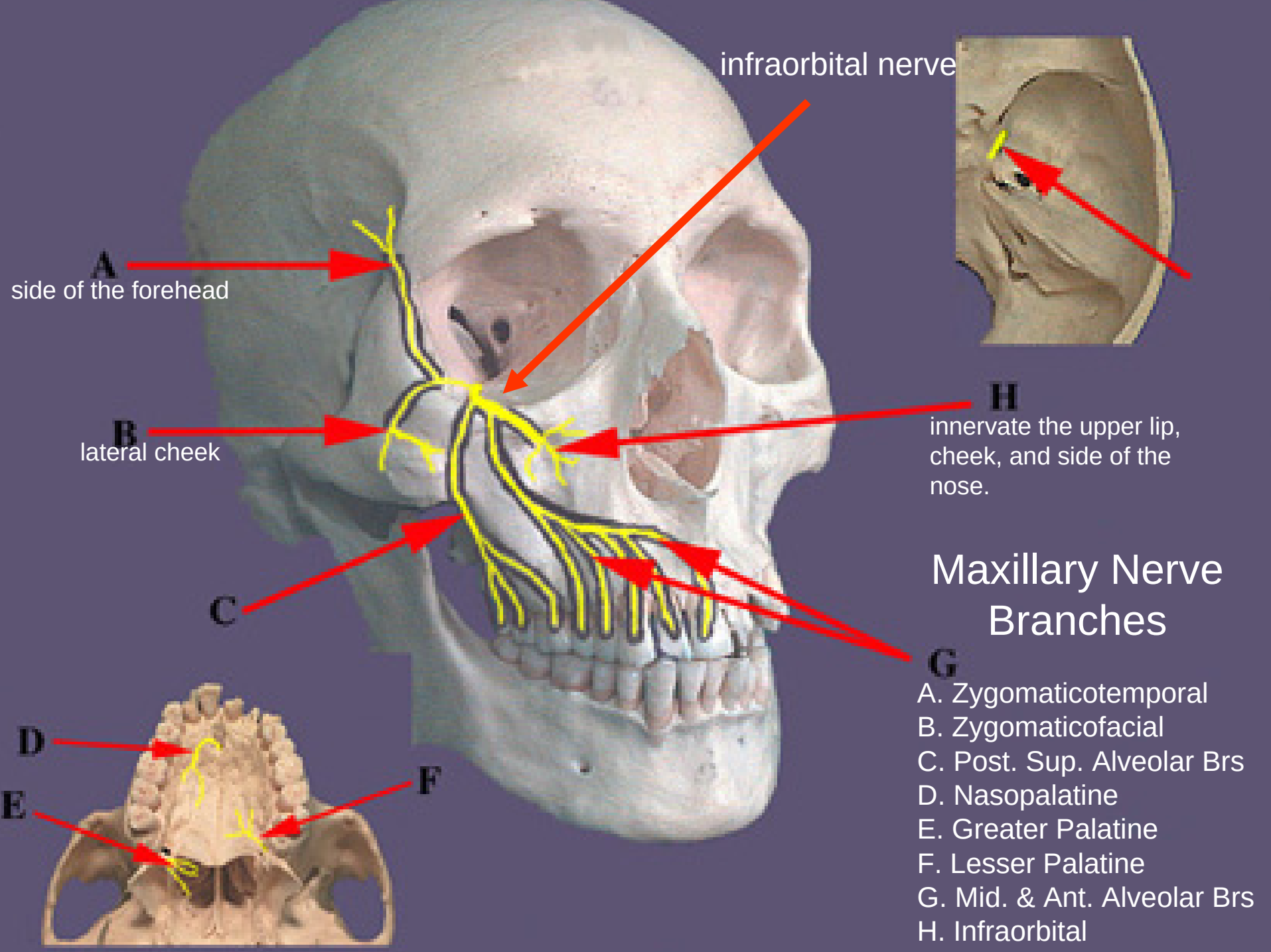
Maxillary Nerve: CN V2

Function: main sensory nerve of the lower face (touch, temp. pain)

Origin: middle region of face, nasal mucosa, maxillary sinus, palate, upper teeth and gums

Compostion: sensory

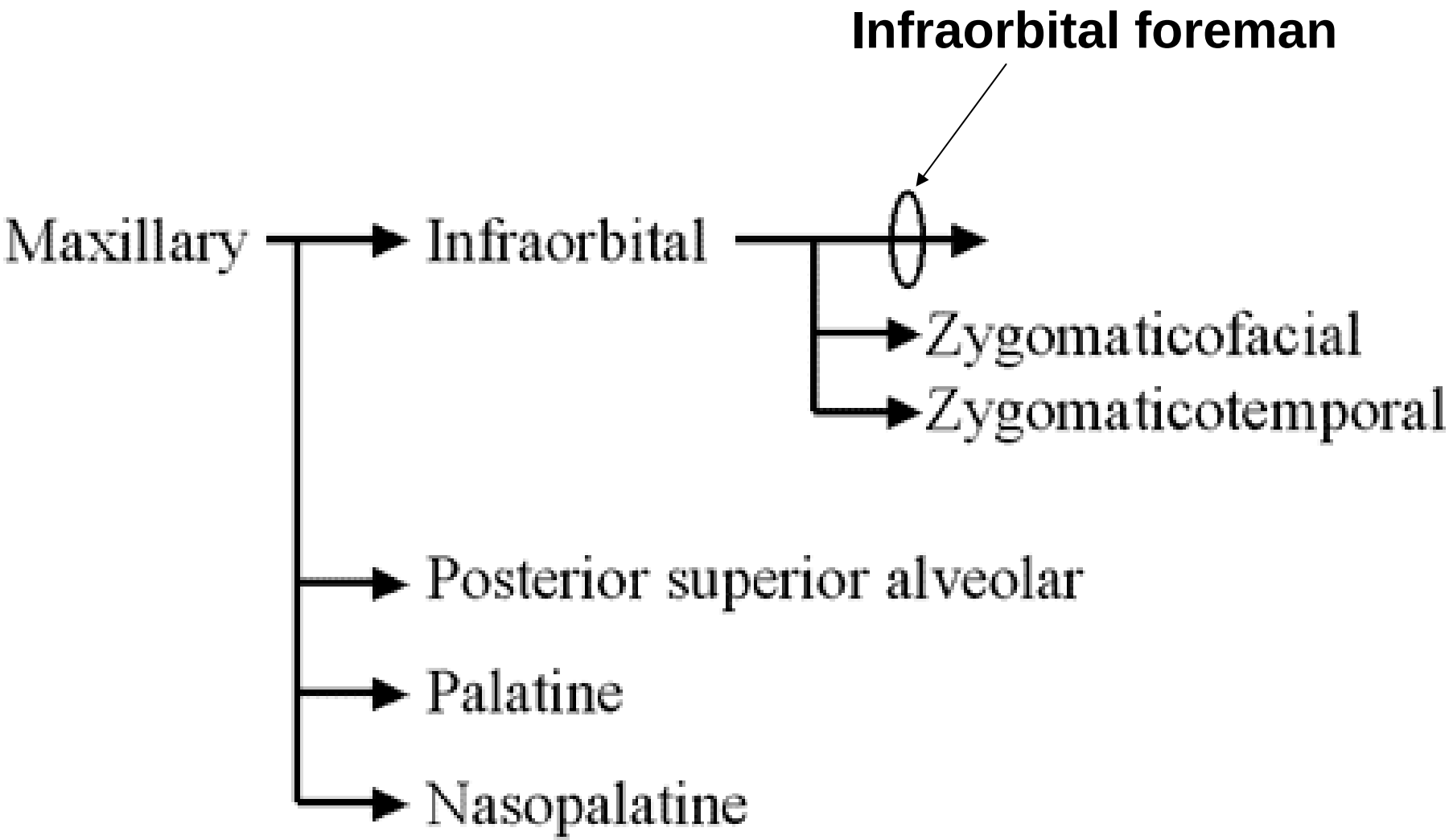
Termination: Pons



Maxillary Nerve Branches

A. Zygomaticotemporal
B. Zygomaticofacial
C. Post. Sup. Alveolar Brs
D. Nasopalatine
E. Greater Palatine
F. Lesser Palatine
G. Mid. & Ant. Alveolar Brs
H. Infraorbital

Maxillary Nerve: CN V^2



- The maxillary nerve exits the cranium through the foramen rotundum and enters the pterygopalatine fossa.
- In the fossa, several sensory branches to the teeth and palate are given off.
  - the greater and lesser palatine nerves,
  - the nasopalatine nerve,
  - the posterior superior alveolar nerve
  - communicating branches to the pterygopalatine ganglion.

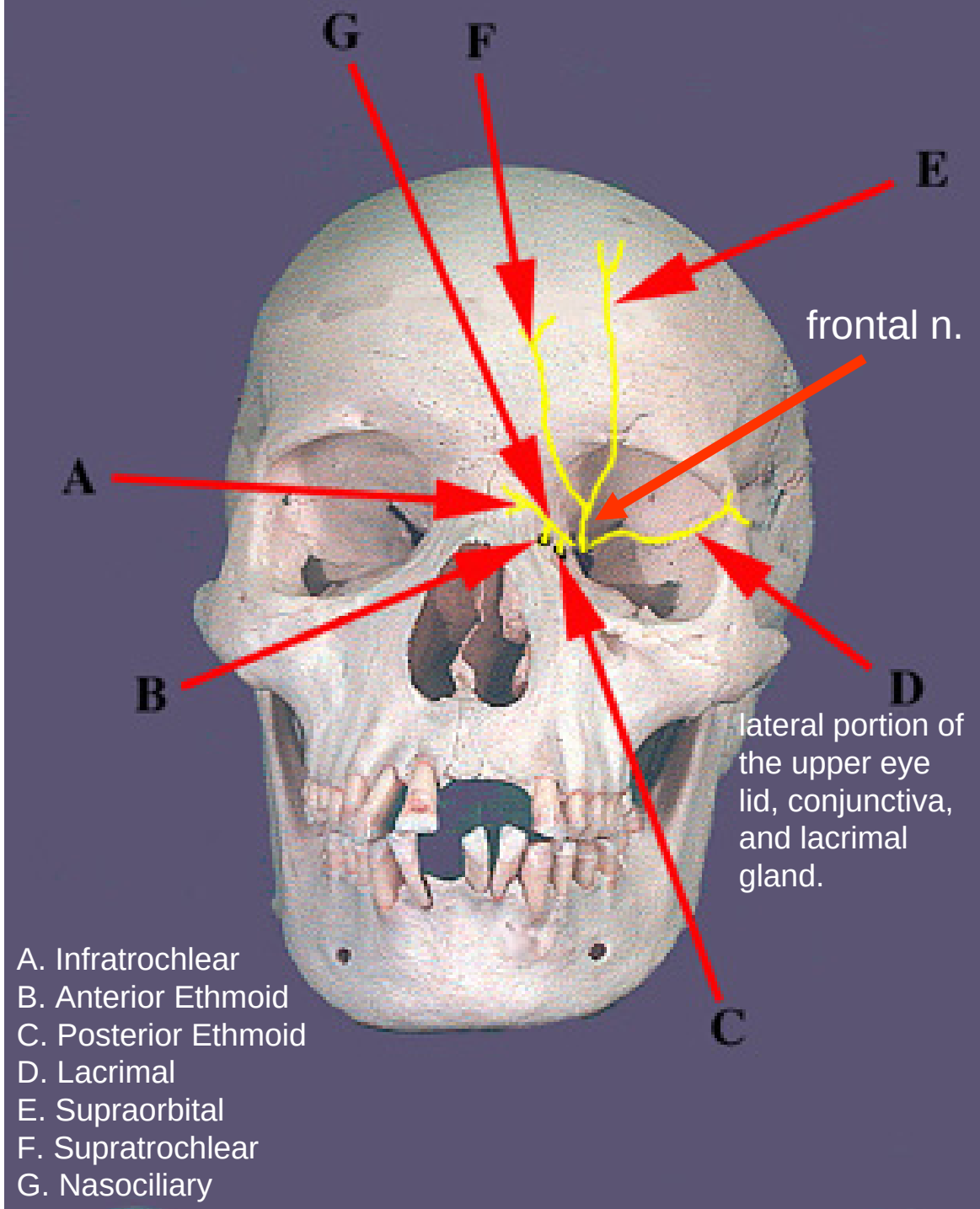
Ophthalmic Division (V^{I})

•The ophthalmic nerve divides into three named sensory nerves as it passes through the **superior orbital fissure**; the frontal, lacrimal, and nasociliary nerves.

Function: main sensory nerve of the upper face (touch, temp. pain)

Origin: superior region of face, surface of eyeball, tear gland, superior nasal mucosa, frontal and ethmoid sinuses

Composition: sensory



Abducens Nerve (CN VI)

Abducens Nerve (CN VI)

- Supplies the **lateral rectus muscle**.
- fibres originate from the **ipsilateral abducens nuclei** located in the caudal pons beneath the 4th ventricle
- exist through the **superior orbital fissure**

Clinical Significance of the Abducens Nerve (Lateral Gaze)

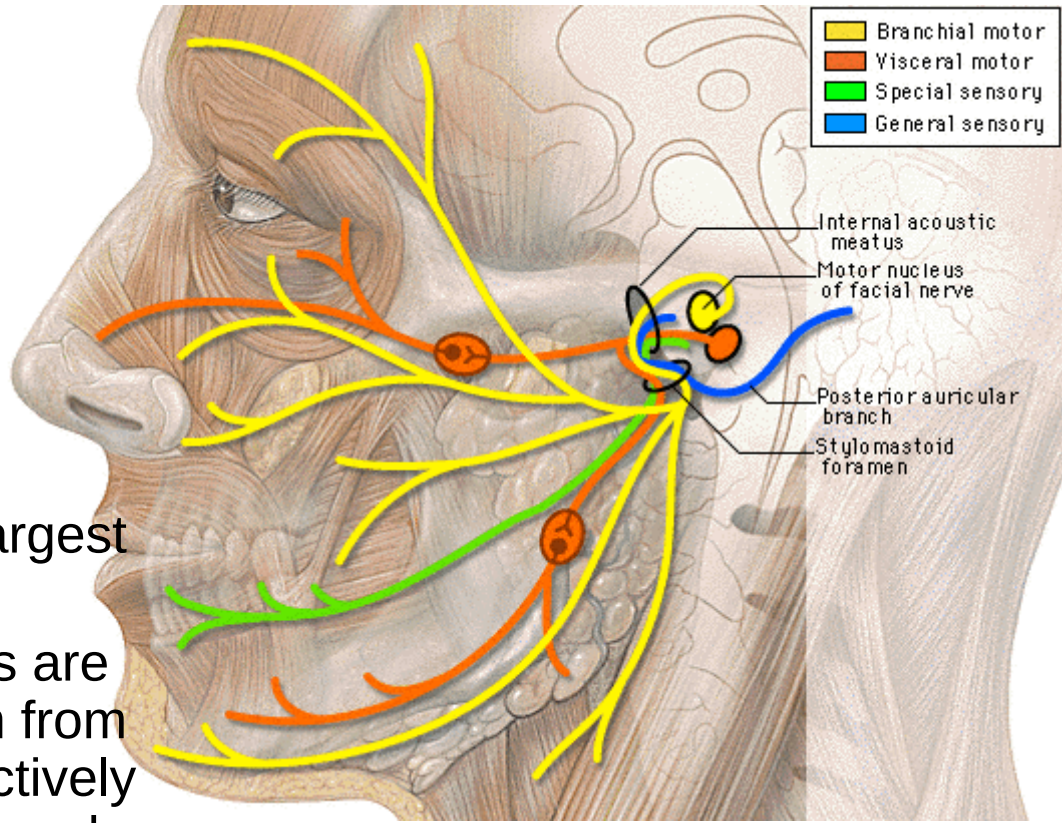
- This causes **medial strabismus** (the affected eye deviates medially by the unopposed action of the medial rectus muscle).
- The individual may be able to move the affected eye to the midline, but no further, by relaxing the **medial rectus muscle**.

Abducens Nerve Damage (CN VI)

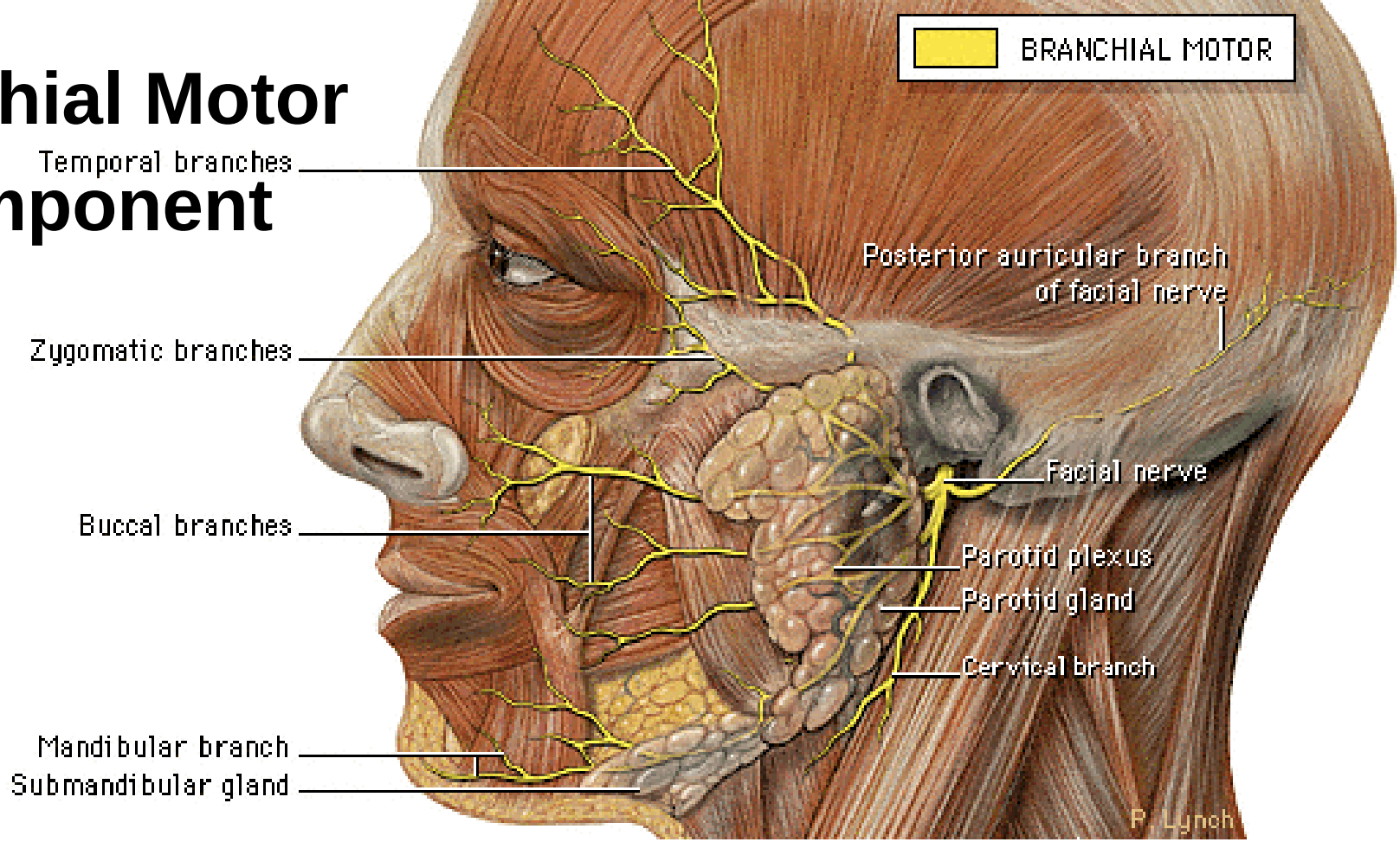
Facial Nerve (CN VII)

Facial Nerve (CN VII)

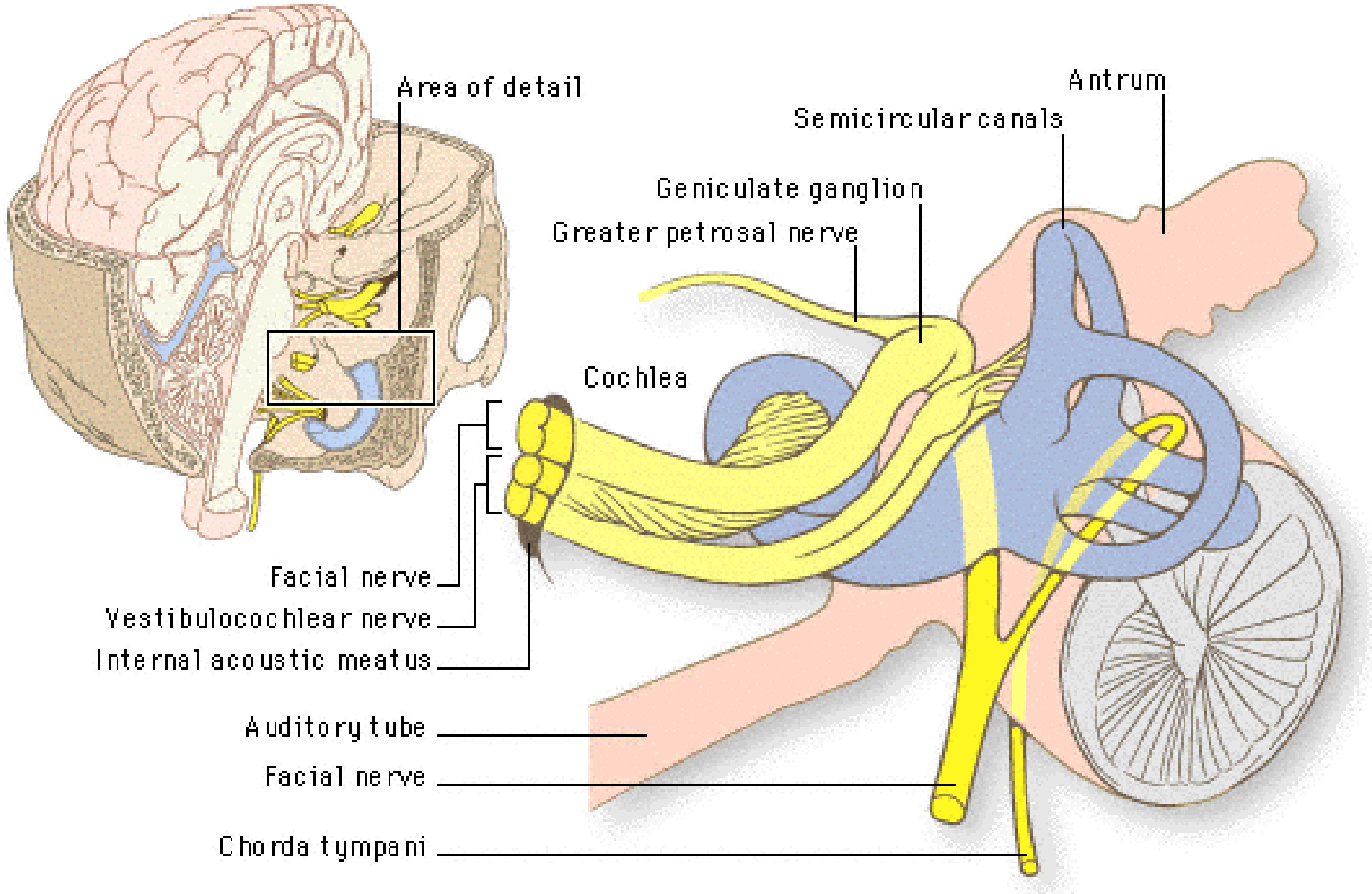
- Has four components with distinct functions:
  - Brancial motor (special visceral efferent)
  - Visceral motor (general visceral efferent)
  - Special sensory (special afferent)
  - General sensory (general somatic afferent)
- Branchial motor constitues the largest portion
- The remaining three components are bound in a distinct fascial sheath from the branchial motor fibers. Collectively these three components are referred to as the **nervus intermedius.**



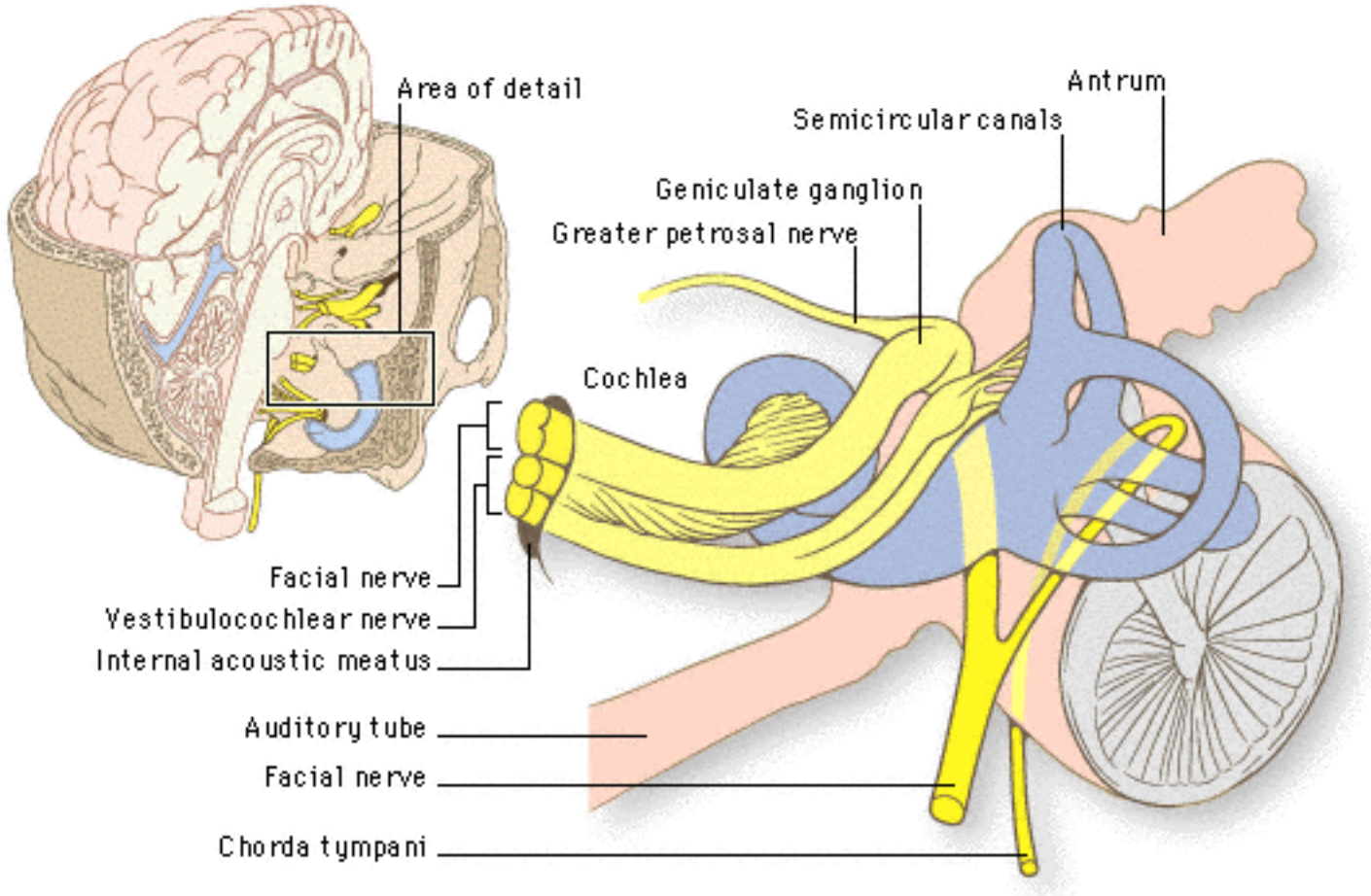
Branchial Motor Component



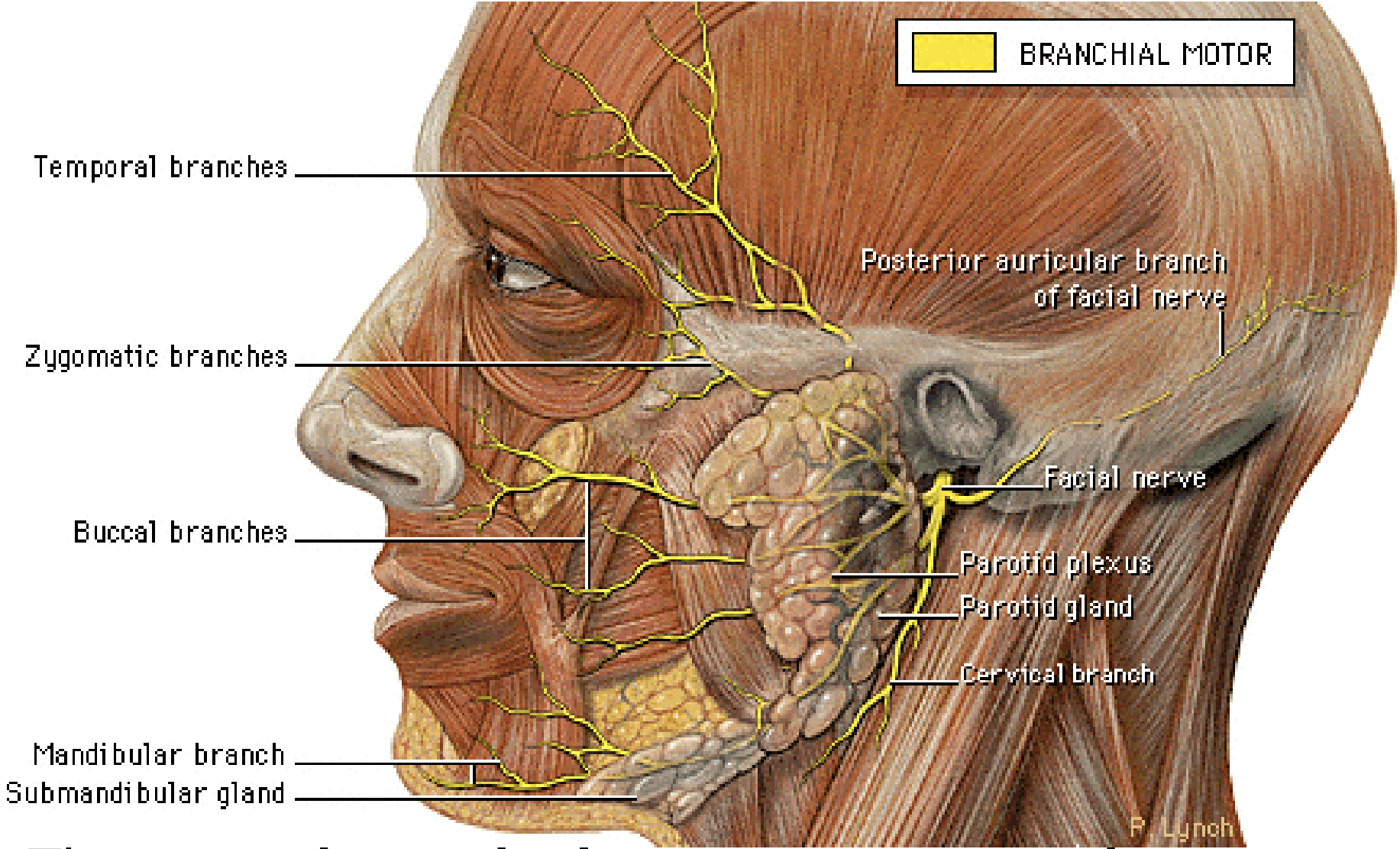
- Provides voluntary control of the muscles of facial expression (including buccinator, occipitalis and platysma muscles), as well as the posterior belly of the digastric, stylohyoid and stapedius muscles.



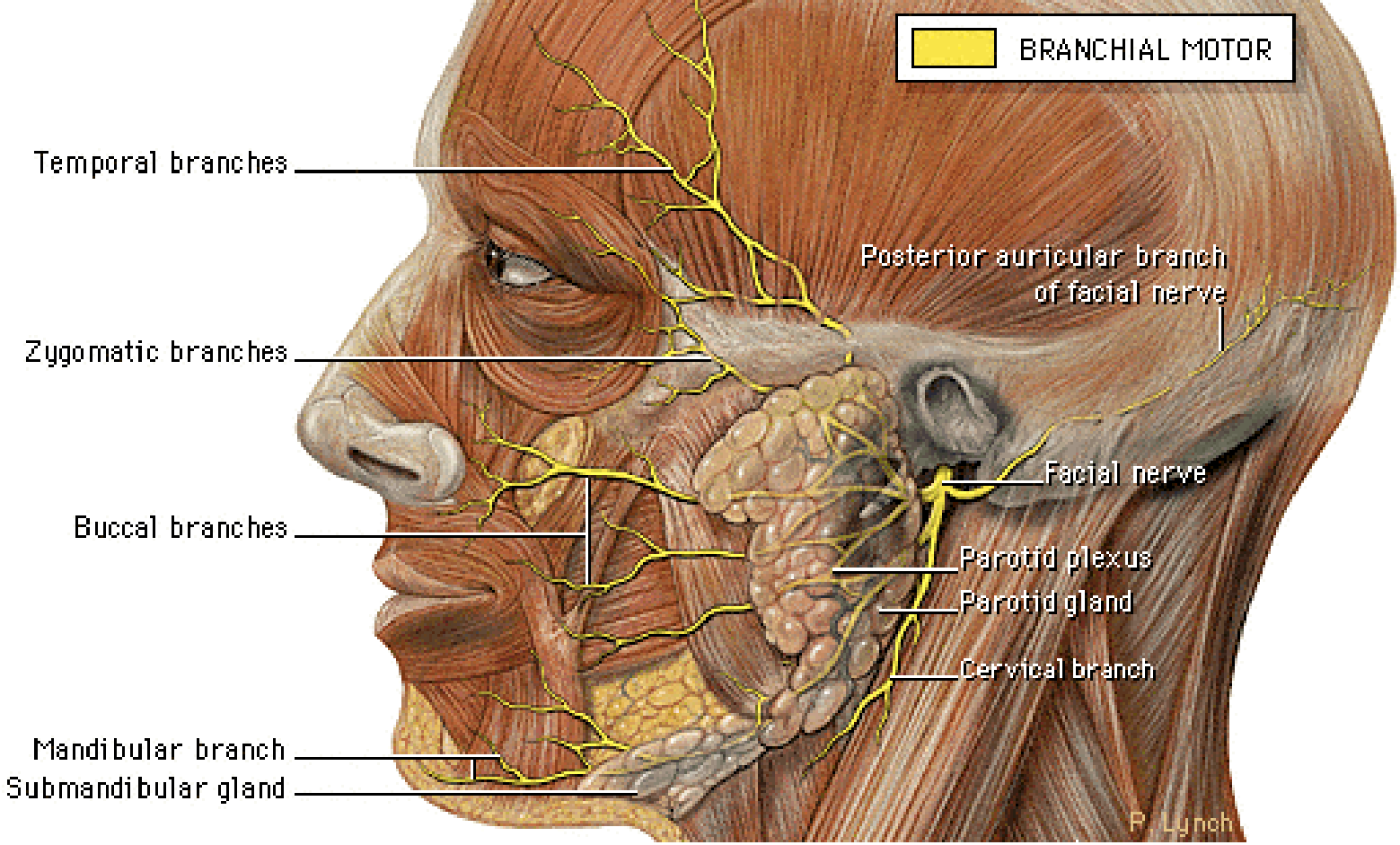
- after emerging from the caudal pons, all of the components of CN VII enter the internal auditory meatus along with the fibers of CN VIII(vestibulocochlear nerve).
- The fibers of CN VII pass through the facial canal in the petrous portion of the temporal bone, course along the roof of the vestibule of the inner ear, just posterior to the cochlea.



- At the **geniculate ganglion** (The sensory ganglion of the facial nerve) the various components of the facial nerve take different pathways.
- Fibers of the branchial motor component pass through the geniculate ganglion without synapsing, turn 90 degrees posteriorly and laterally before curving inferiorly just medial to the middle ear to exit the skull through the **stylomastoid foramen**.
- The **nerve to the stapedius muscle** is given off from the facial nerve in its course through the petrous portion of the temporal bone.

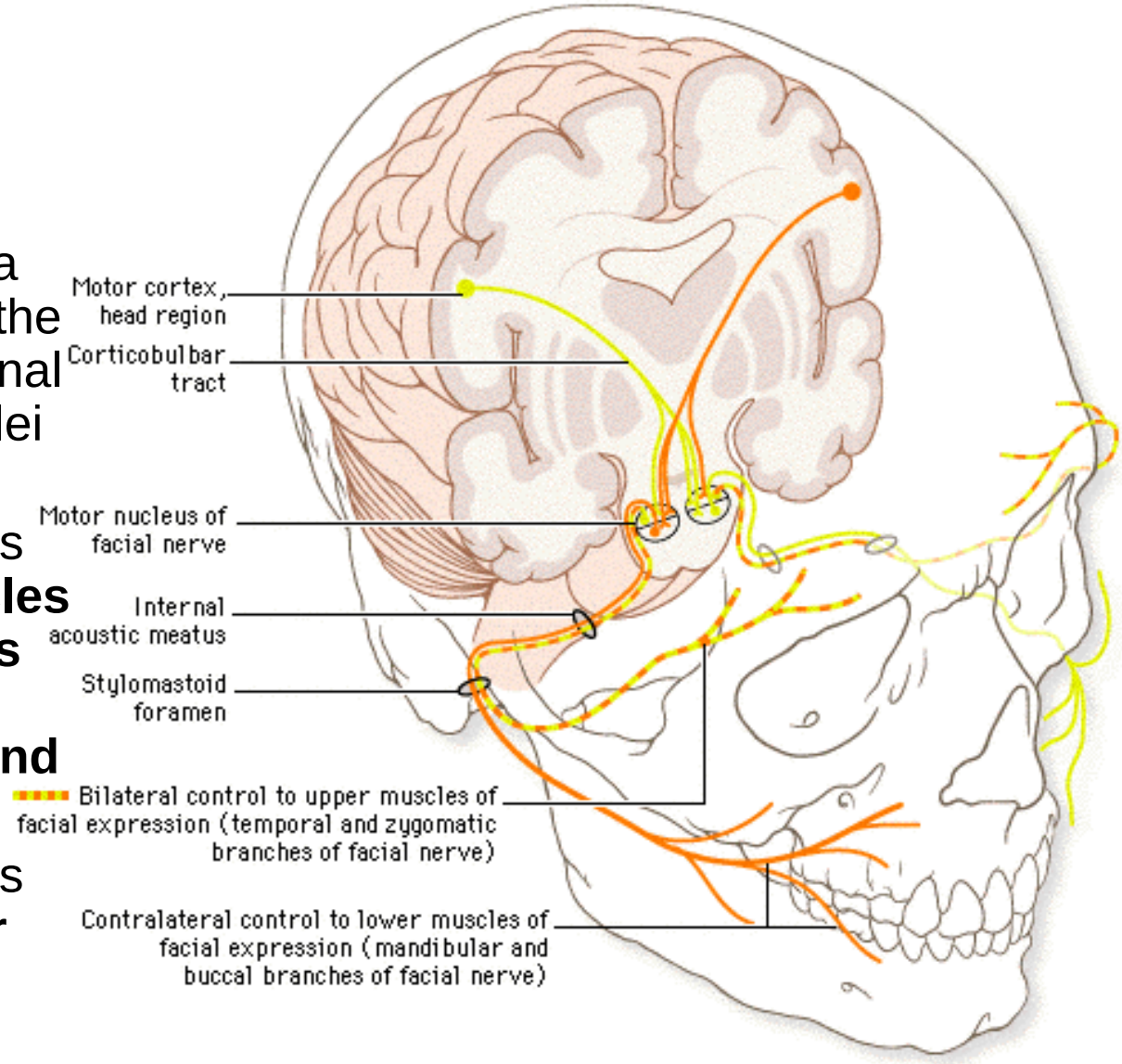


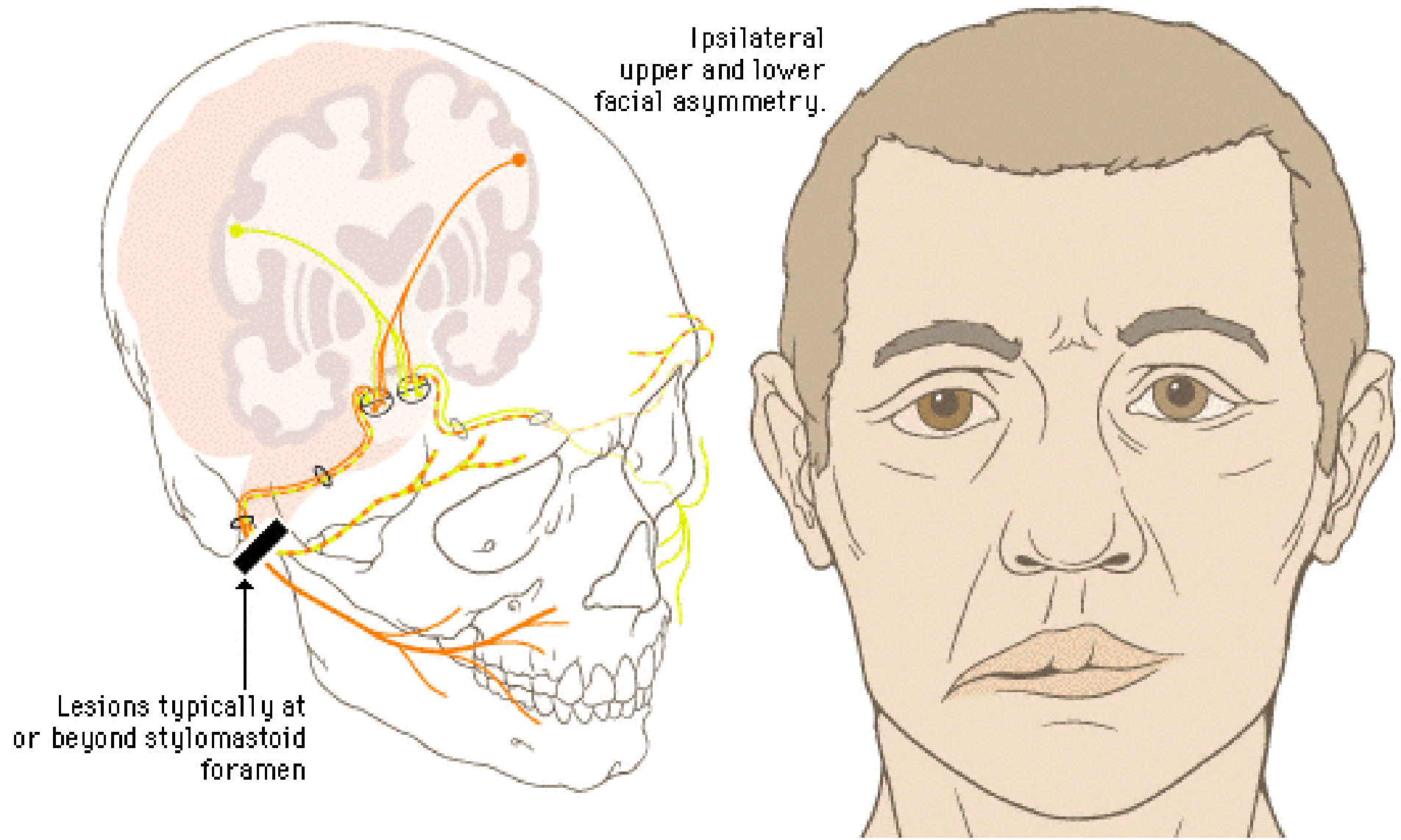
- The **posterior auricular nerve**, **nerve to the posterior belly of the digastric** and the **nerve to the stylohyoid muscle** are given off upon the facial nerve's exit from the stylomastoid foramen.



- The remaining fibers enter the substance of the **parotid gland** and divide to form the temporal, zygomatic, buccal, mandibular, and cervical branches to **innervate the muscles of facial expression**.

- Signals for voluntary movement of the facial muscles originate in the motor cortex and pass via the corticobulbar tract in the posterior limb of the internal capsule to the motor nuclei of CN VII.
- The portion of the nucleus that innervates the **muscles of the forehead receives** corticobulbar fibers from **both the contralateral and ipsilateral** motor cortex.
- The portion of the nucleus that innervates **the lower muscles of facial expression receives** corticobulbar fibers from **only the contralateral** motor cortex.


Motor cortex, head region
Corticobulbar tract
Motor nucleus of facial nerve
Internal acoustic meatus
Stylomastoid foramen
Bilateral control to upper muscles of facial expression (temporal and zygomatic branches of facial nerve)
Contralateral control to lower muscles of facial expression (mandibular and buccal branches of facial nerve)



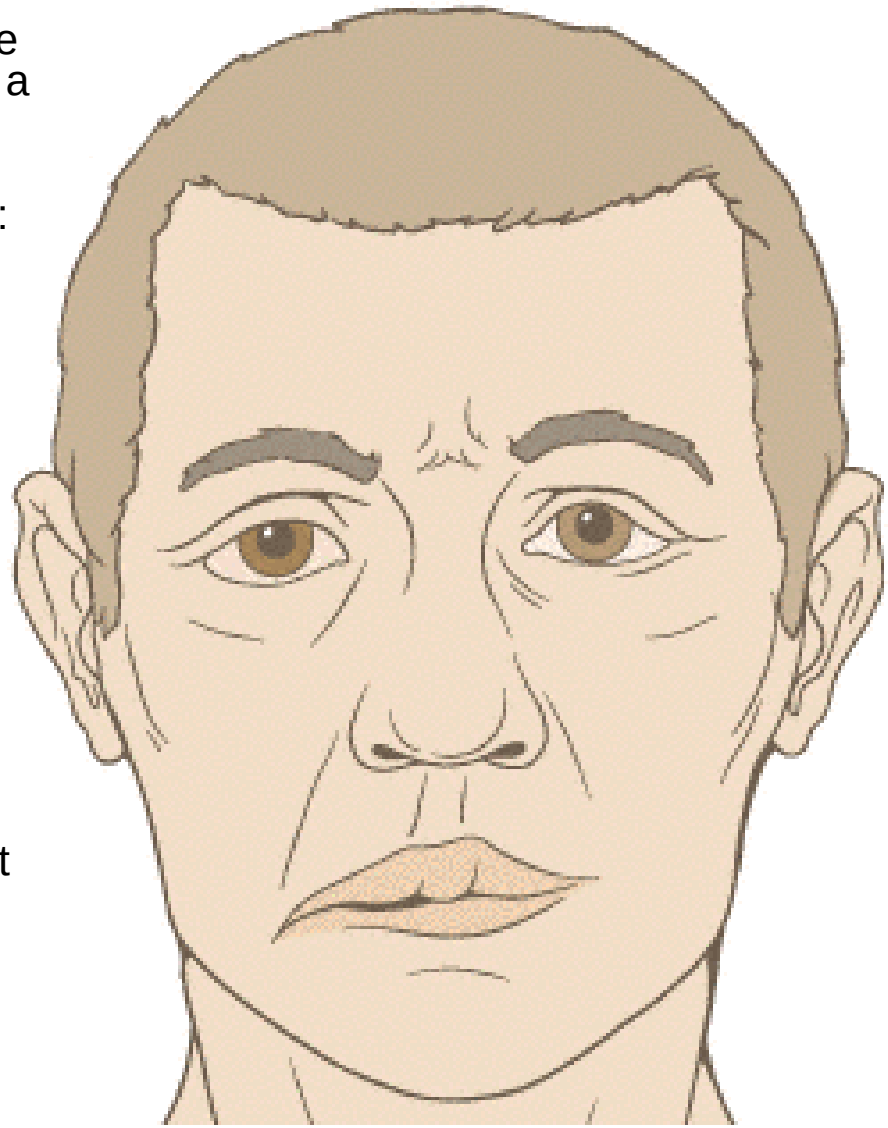
- **Lower Motor Neuron (LMN) Lesion** results in the paralysis of all muscles of facial expression (including those of the forehead) ipsilateral to the lesion.

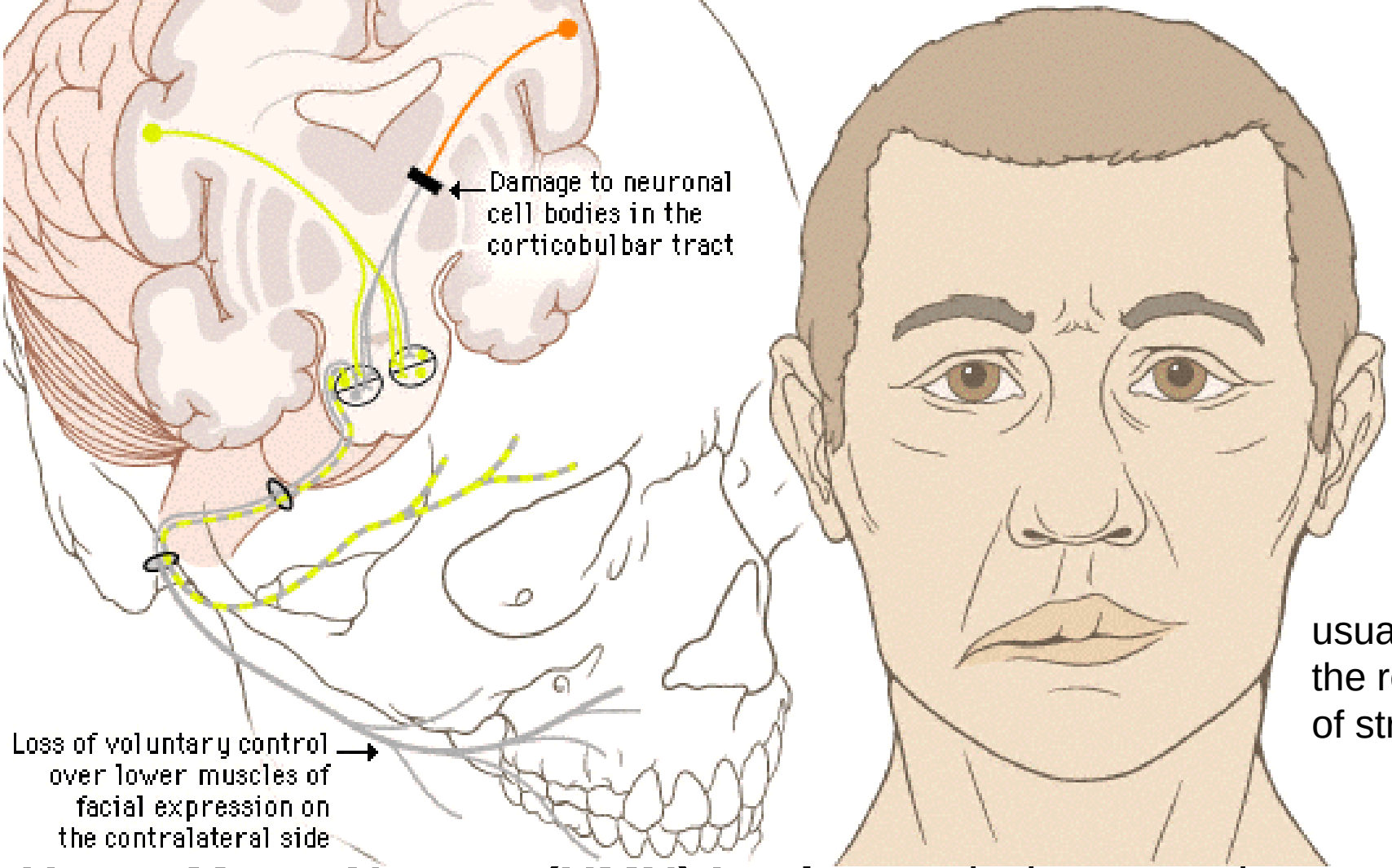
Bell’s Palsy

A LMN lesion of CN VII which occurs at or beyond the stylomastoid foramen is commonly referred to as a Bell's Palsy.

Characteristic indications of a LMN lesion or Bell's Palsy include the following, **on the affected side**:

- Marked facial asymmetry
- Atrophy of facial muscles
- Eyebrow droop
- Smoothing out of forehead and nasolabial folds
- Drooping of the mouth corner
- Uncontrolled tearing
- Loss of efferent limb of conjunctival reflex (cannot close eye)
- Lips cannot be held tightly together or pursed
- Diificulty keeping food in mouth while chewing on the affected side




Damage to neuronal cell bodies in the corticobulbar tract
Loss of voluntary control over lower muscles of facial expression on the contralateral side

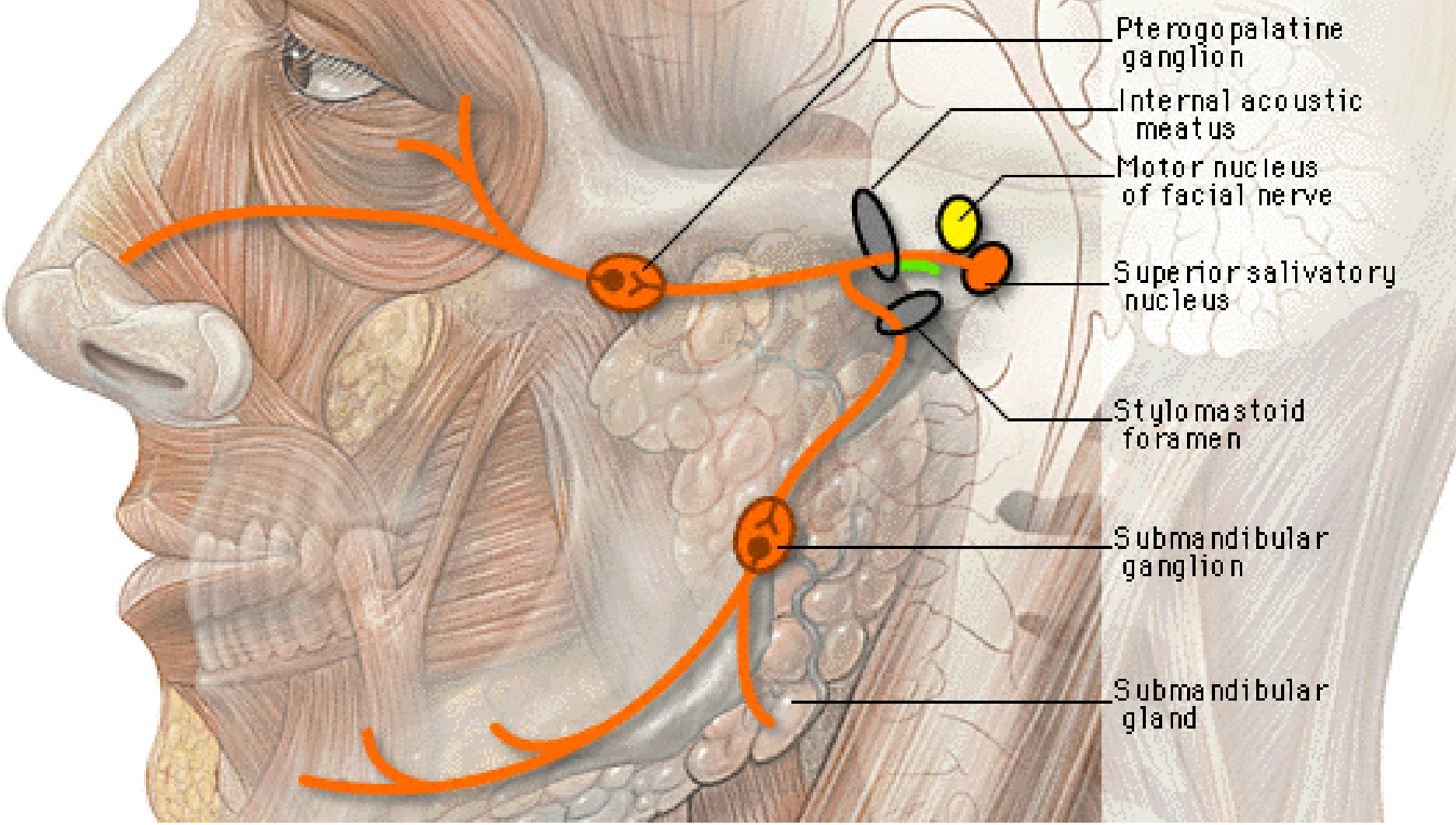
usually the result of stroke

- **Upper Motor Neuron (UMN) Lesion** or their axons that project via the corticobulbar tract through the posterior limb of the internal capsule to the motor nucleus of CN VII.
- voluntary control of only the lower muscles of facial expression on the side contralateral to the lesion will be lost.

Upper Motor Neuron Damage

Characteristics of an UMN lesion of the facial nerve include:

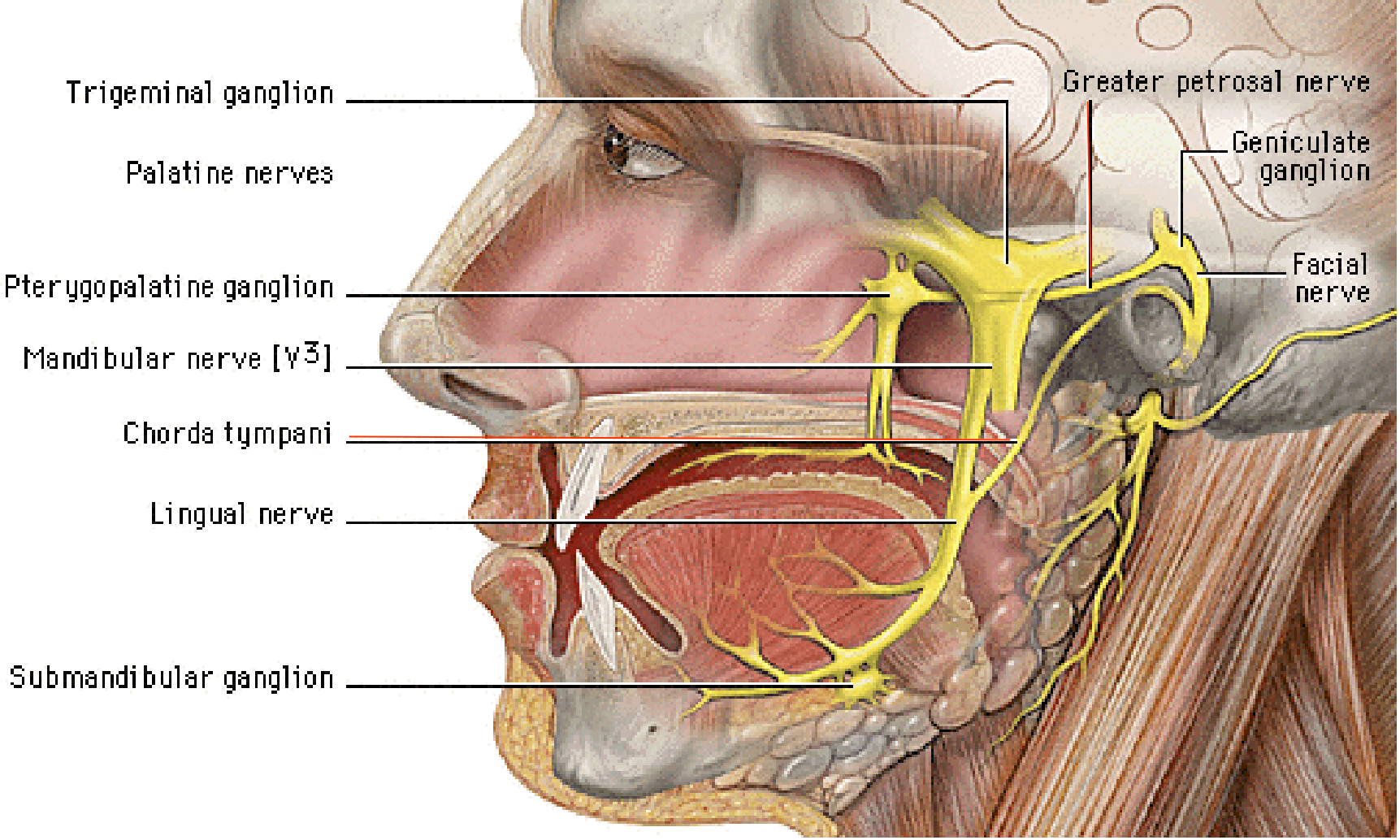
- Facial asymmetry
- Atrophy of muscles of **lower** portion of the face on affected side*
- **No** eyebrow droop*
- Intact folds on forehead*
- Intact conjunctival reflex (orbicularis oculi innervation is intact)
- Smoothing of nasolabial folds on affected side
- Lips cannot be held tightly together or pursed
- Difficulty keeping food in mouth while chewing on affected side



Visceral Motor Component

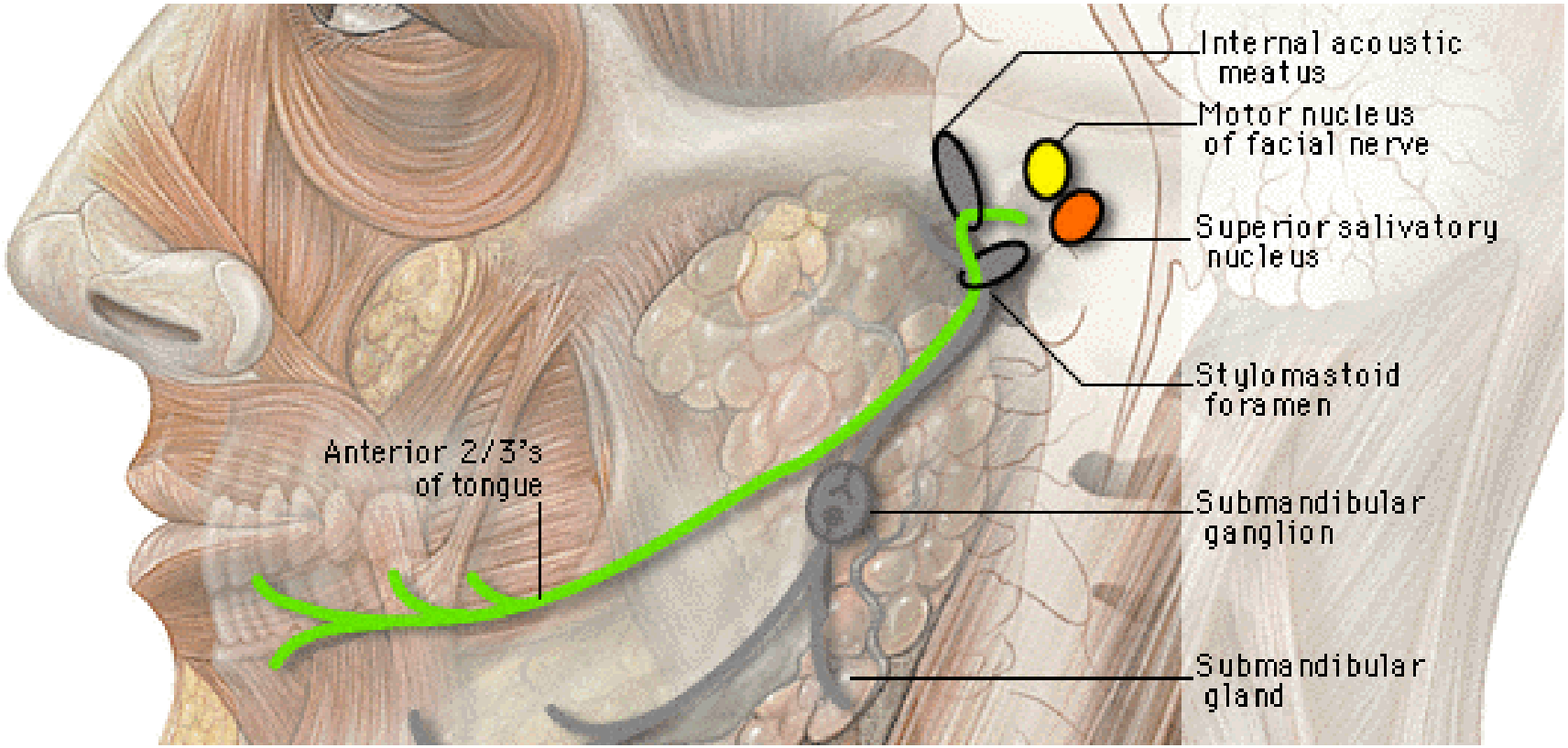
- Parasympathetic component of the facial nerve consists of efferent fibers which stimulate secretion from the **submandibular**, **sublingual**, and **lacrimal glands**, as well as the **mucous membranes of the nasopharynx and hard and soft palates.**

- The visceral motor component originates in the caudal pons just below the facial nucleus in a group of cells known as the **superior salivatory nucleus.**
- **Upon emerging from the ventrolateral aspect of the caudal border of the pons, all of the components of CN VII enter the internal auditory meatus along with the fibers of CN VIII (vestibulocochlear nerve).**
- Within the facial canal the visceral motor fibers divide into two groups to become the **greater petrosal nerve** and the **chorda tympani**:



- **The greater petrosal nerve supplies the lacrimal, nasal, and palatine glands.**
- **The chorda tympani follows the lingual nerve to the submandibular ganglia then postganglionic fibers supplies the submandibular and sublingual glands.**

Special Sensory Component

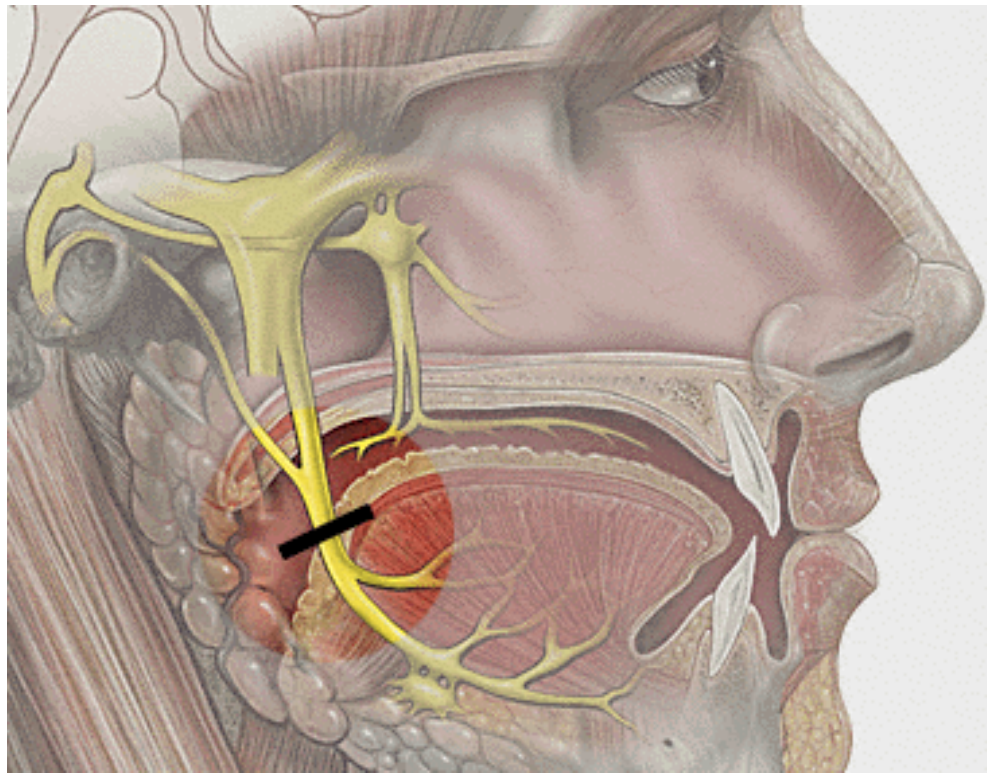


- Consists of afferent fibers which convey taste information from the anterior 2/3 of the tongue and the hard and soft palates to the rostral portion of the **nucleus solitarius** - also referred to as the **gustatory nucleus**:
- fibers then project both ipsilaterally and contralaterally to the **ventral posteromedial (VPM) nucleus of the thalamus**, then to that portion of the cerebral cortex responsible for taste.

General Sensory Component

- consists of afferent fibers which convey general sensory information from the skin of the concha of the external ear and from a small area of skin behind the ear to the geniculate ganglion, then to the ventral posteromedial (VPM) thalamus and cortex

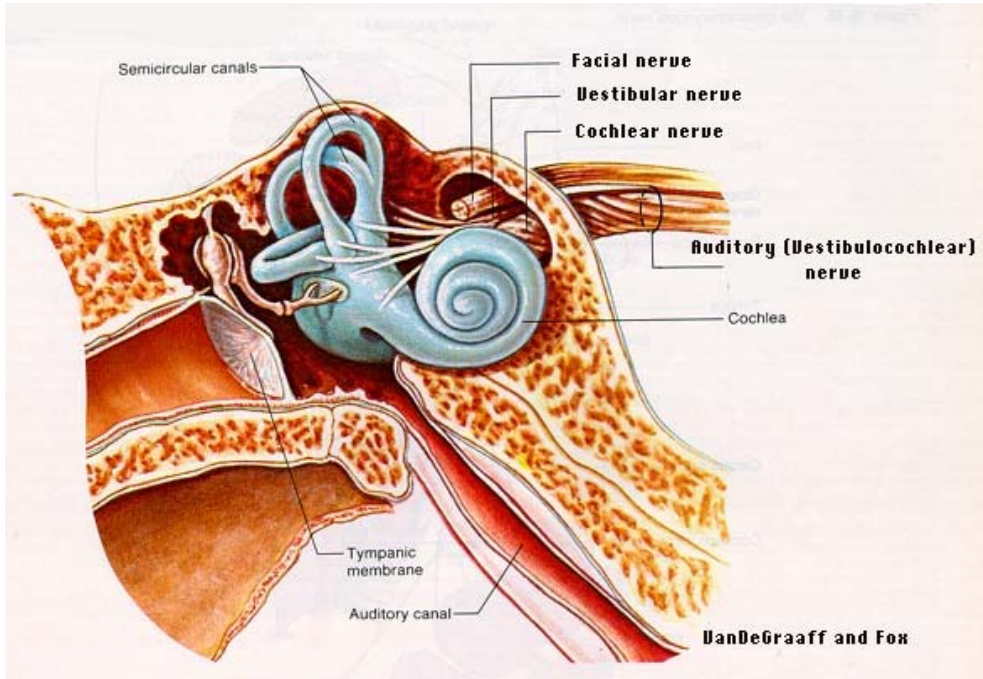
- A lesion which affected the lingual nerve just distal to its junction with the chorda tympani would present as follows:
- Loss of secretion from submandibular and sublingual glands ipsilateral to the lesion (visceral motor component of CN VII) Loss of taste from anterior 2/3 of tongue ipsilateral to the lesion (special sensory component of CN VII) Loss of general sensation from the tongue (general sensory component of CN V3).



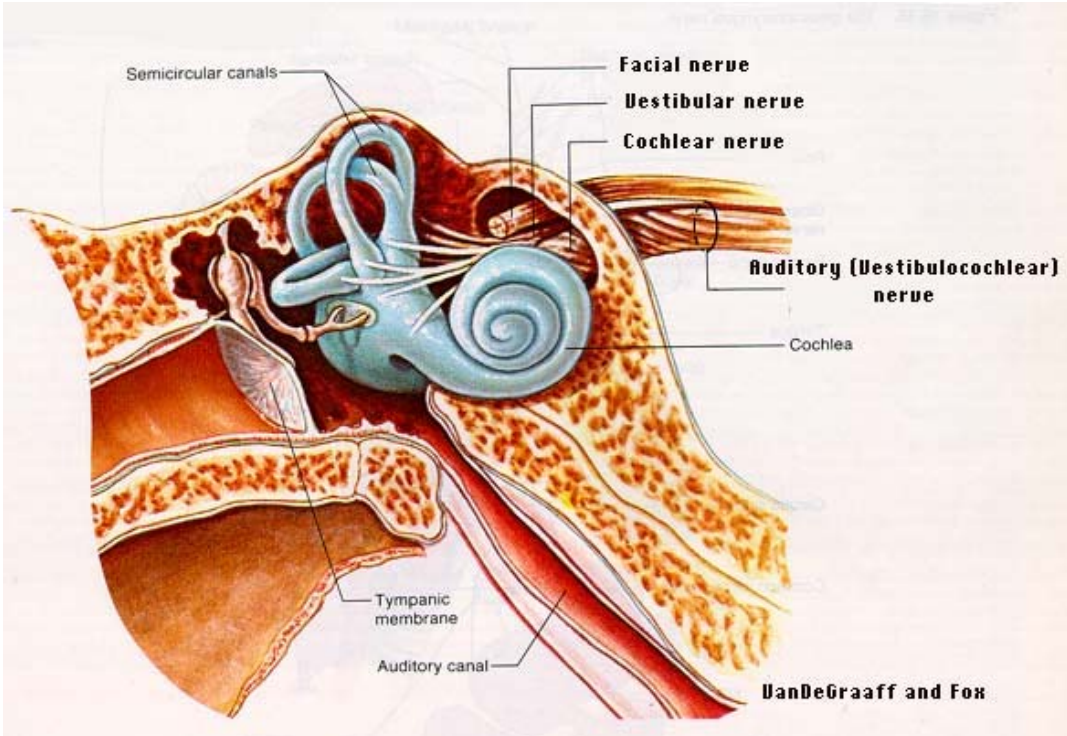
Vestibulocochlear (VIII)

It is a sensory nerve composed of two branches that arise within the inner ear.

- **vestibular branch** arises from the vestibular organs of equilibrium and balance.
- relays afferent information related to the position and movement of the head
- Central processes of the vestibular nerve are located in the vestibular ganglion, which is situated in the internal acoustic meatus.
- Its fibres conduct impulses to the vestibular nuclei within the pons and medulla oblongata.
- Fibres from there extend to the thalamus and cerebellum.



- **cochlear branch** arises from the **Organ of Corti** in the cochlea and is concerned with hearing.
- It conveys impulses through the spiral ganglion to the cochlear nuclei within the medulla oblongata.
- From there fibres extend to the thalamus and synapse there with neurons that convey the impulses to the auditory areas of the cerebral cortex.



Glossopharyngeal CN IX

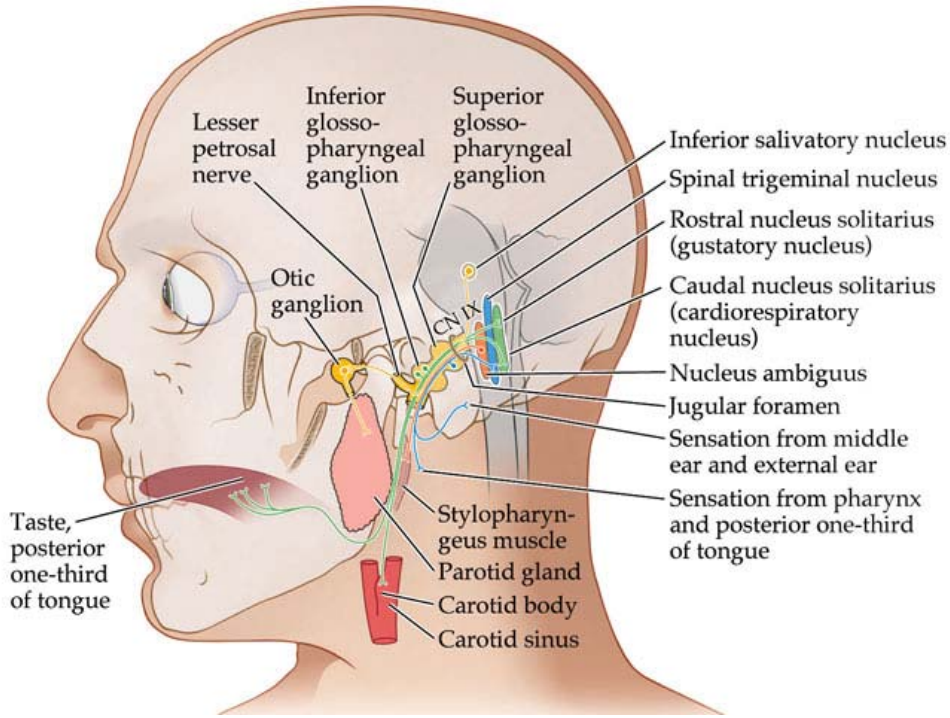
Cranial Nerve IX - Glossopharyngeal

The glossopharyngeal nerve consists of five components with distinct functions:

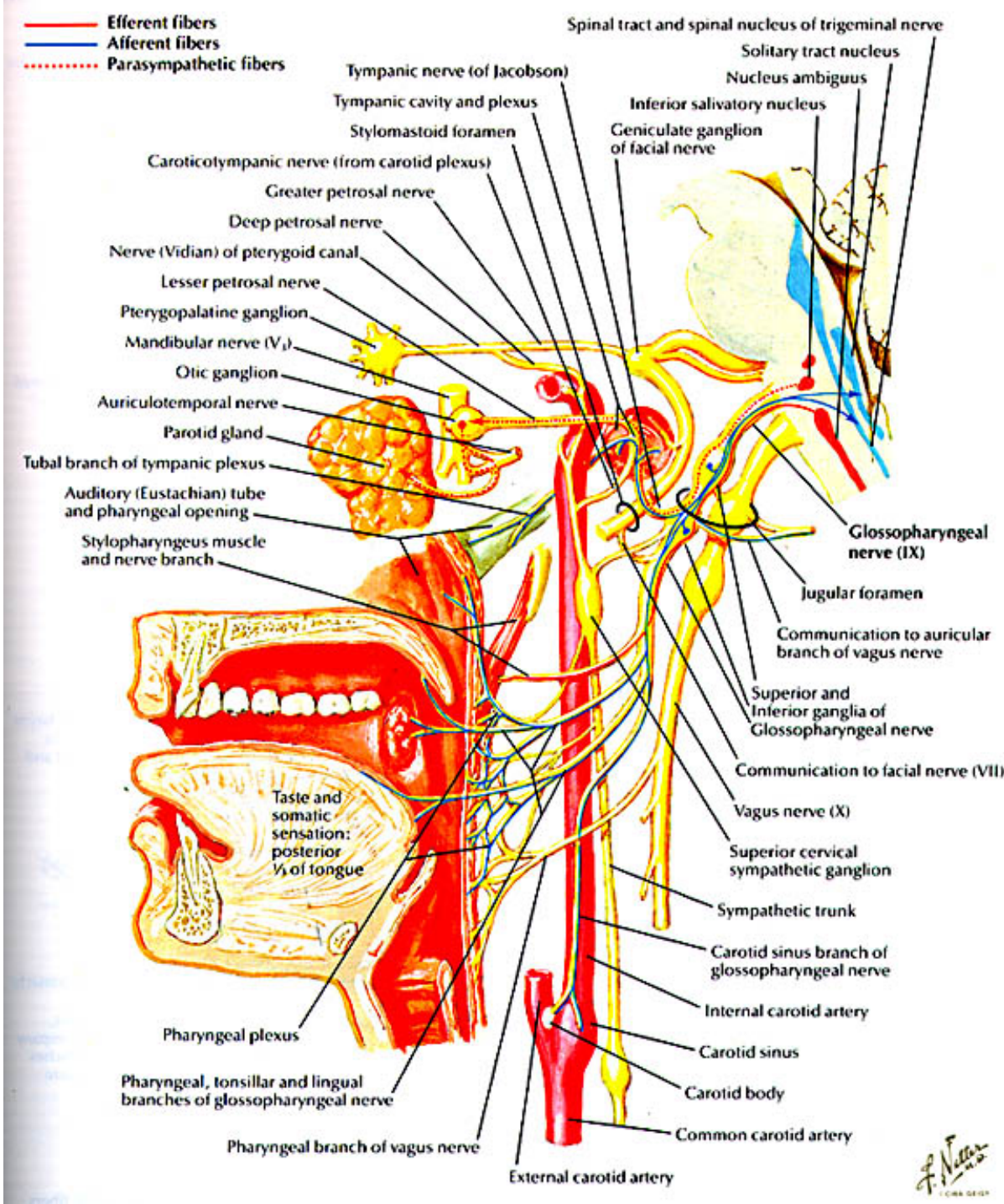
1. Branchial motor (special visceral efferent)- Supplies the stylopharyngeus muscle.
2. Visceral motor (general visceral efferent)- Parasympathetic innervation of the smooth muscle and glands of the pharynx, larynx, and viscera of the thorax and abdomen.
3. Visceral sensory (general visceral afferent)- Carries visceral sensory information from the carotid sinus and body.

Cranial Nerve IX - Glossopharyngeal

3. General sensory (general somatic afferent)- Provides general sensory information from the skin of the external ear, internal surface of the tympanic membrane, upper pharynx, and the posterior one-third of the tongue.
4. Special sensory (special afferent)- Provides taste sensation from the posterior one-third of the tongue.

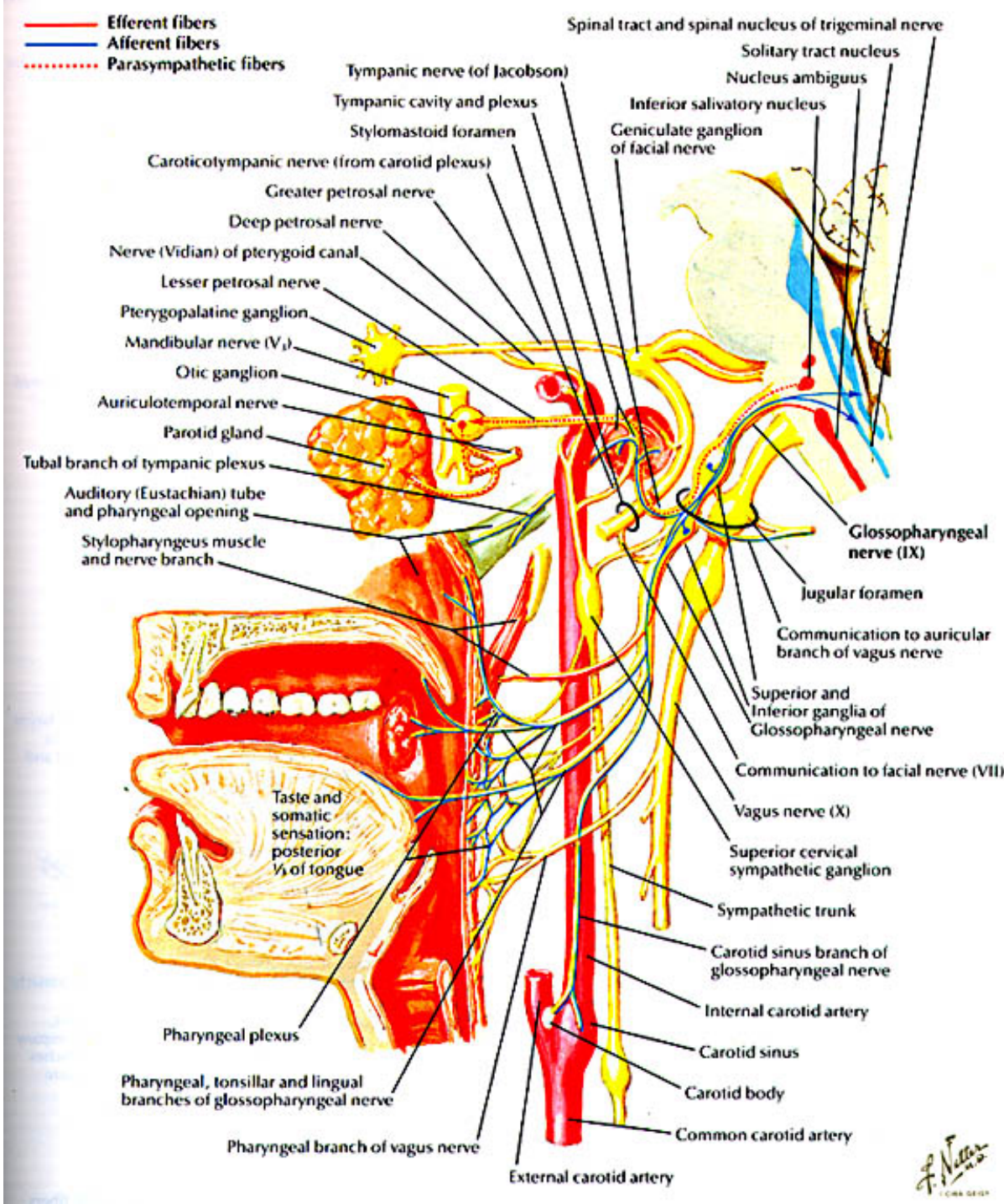

Lesser petrosal nerve
Inferior glosso-pharyngeal ganglion
Superior glosso-pharyngeal ganglion
Otic ganglion
CN IX
Inferior salivatory nucleus
Spinal trigeminal nucleus
Rostral nucleus solitarius (gustatory nucleus)
Caudal nucleus solitarius (cardiorespiratory nucleus)
Nucleus ambiguus
Jugular foramen
Sensation from middle ear and external ear
Sensation from pharynx and posterior one-third of tongue
Taste, posterior one-third of tongue
Stylopharyn-geus muscle
Parotid gland
Carotid body
Carotid sinus

- **Branchial Motor Component**
- provides voluntary control of the stylopharyngeus muscle which elevates the pharynx during swallowing and speech.
- originates from the nucleus ambiguus in the reticular formation of the medulla.
- Fibers leaving the nucleus ambiguus exit the medulla and joins the other components of CN IX along with CN X &XI to exit the skull via the jugular foramen.



visceral motor component

- Parasympathetic component of the glossopharyngeal nerve **innervates the ipsilateral parotid gland.**
- preganglionic nerve fibers originate in the **inferior salivatory** nucleus of the rostral medulla
- travels as the **tympanic nerve** to middle ear to provide general sensation
- emerges from the middle ear as the **lesser petrosal nerve**
- It then **exist the skull via the foramen ovale** and synapses with the **otic ganglion**
- postsynaptic fibers leave the ganglion to innervate the parotid gland



Hypothalamic Influence - Visceral Motor Component

- Fibers from the hypothalamus and olfactory system project via the dorsal longitudinal fasciculus to influence the output of the inferior salivatory nucleus.

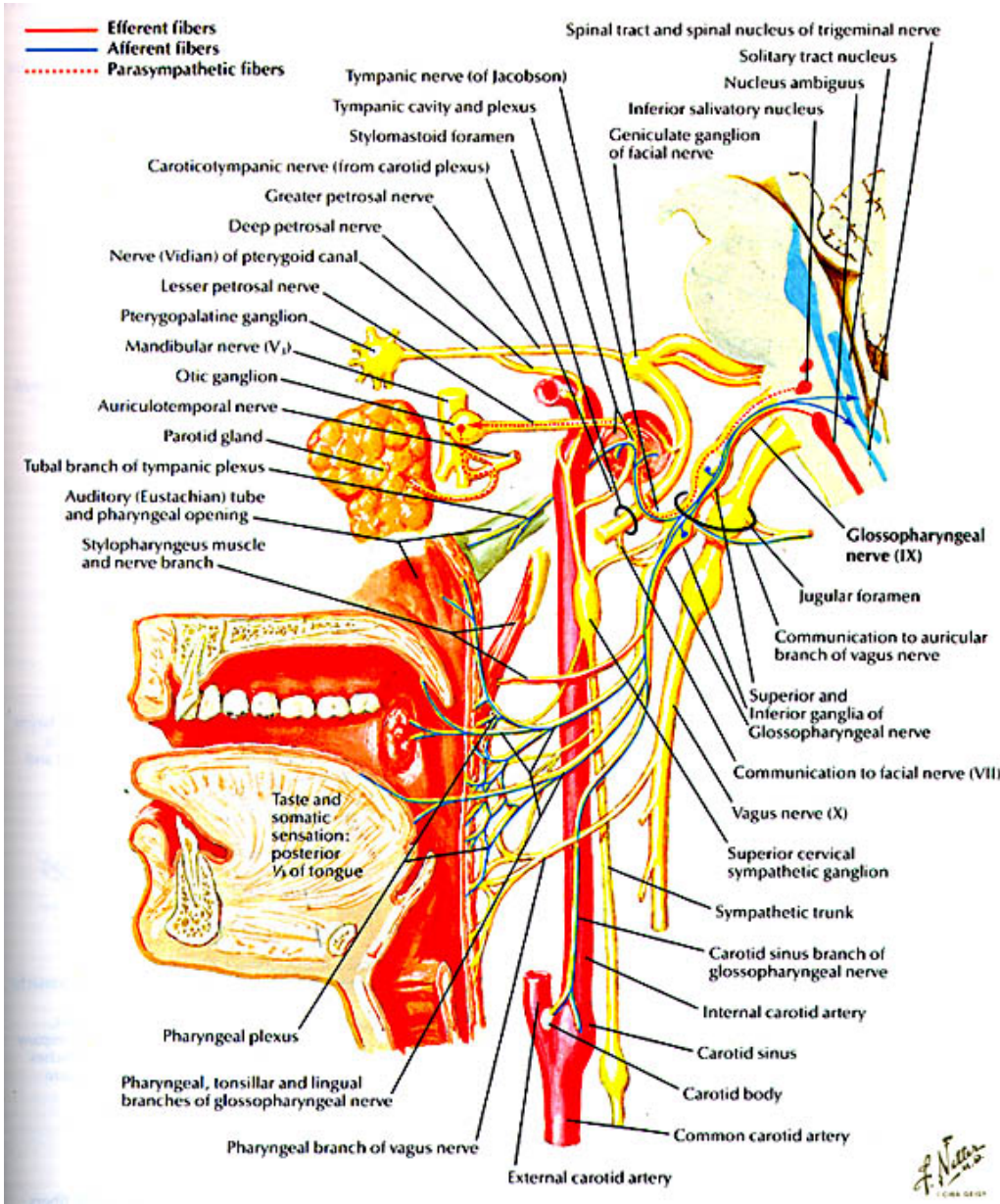
  Examples include:

- Dry mouth in response to fear (mediated by the hypothalamus)

- Salivation in response to smelling food (mediated by the olfactory system)

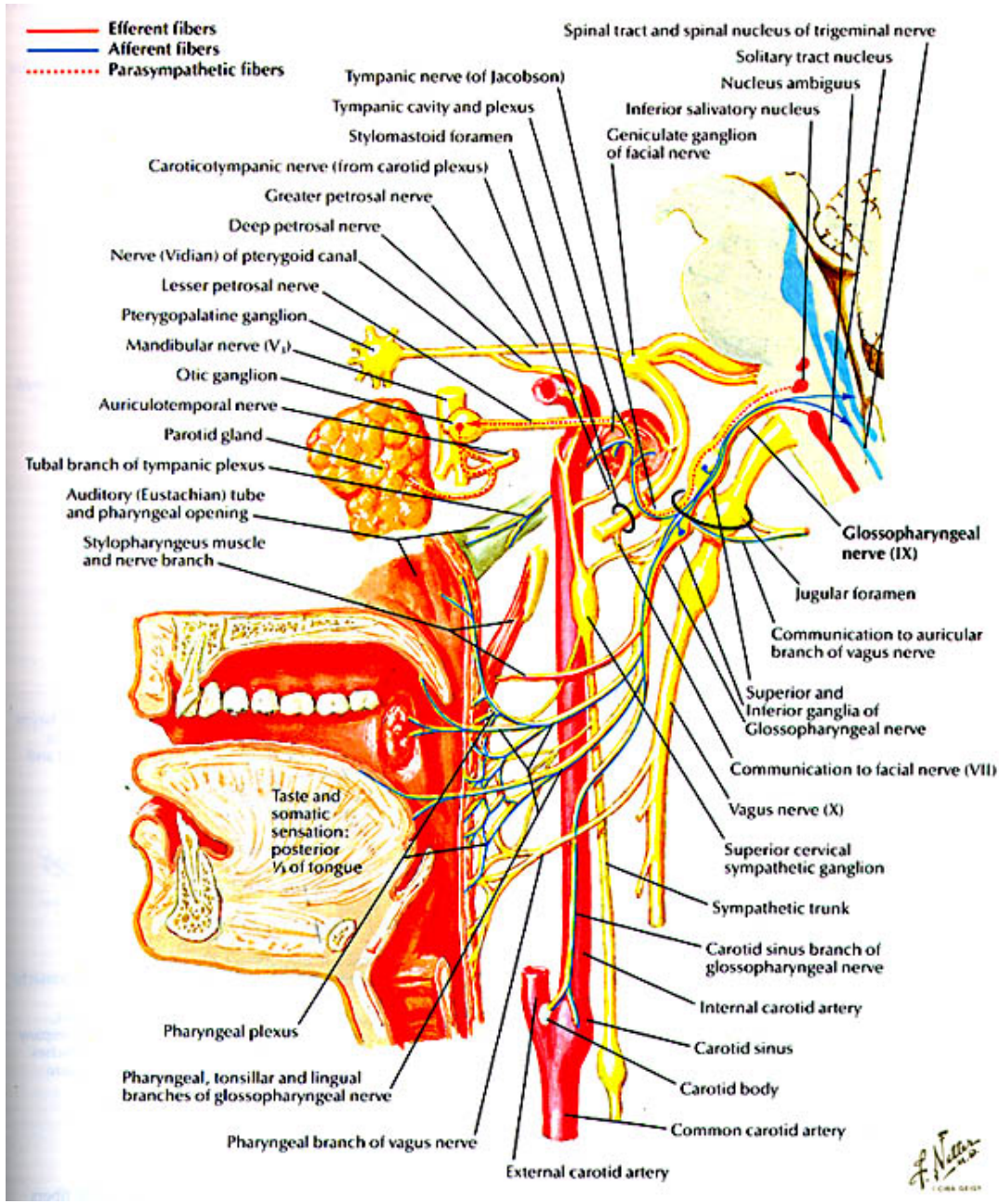
visceral sensory component

- component of CN IX **innervates the baroreceptors of the carotid sinus and chemoreceptors of the carotid body.**
- Once in the skull, fibers eventually connect with several areas of the reticular formation and hypothalamus to mediate cardiovascular and respiratory reflex responses to changes in blood pressure, and serum concentrations of CO2 and O2.



general sensory component

- This component of CN IX carries **general sensory information** (pain, temperature, and touch) from the
  - **skin of the external ear**,
  - **internal surface of the tympanic membrane,**
  - **the walls of the upper pharynx**,
  - **the posterior one-third of the tongue.**

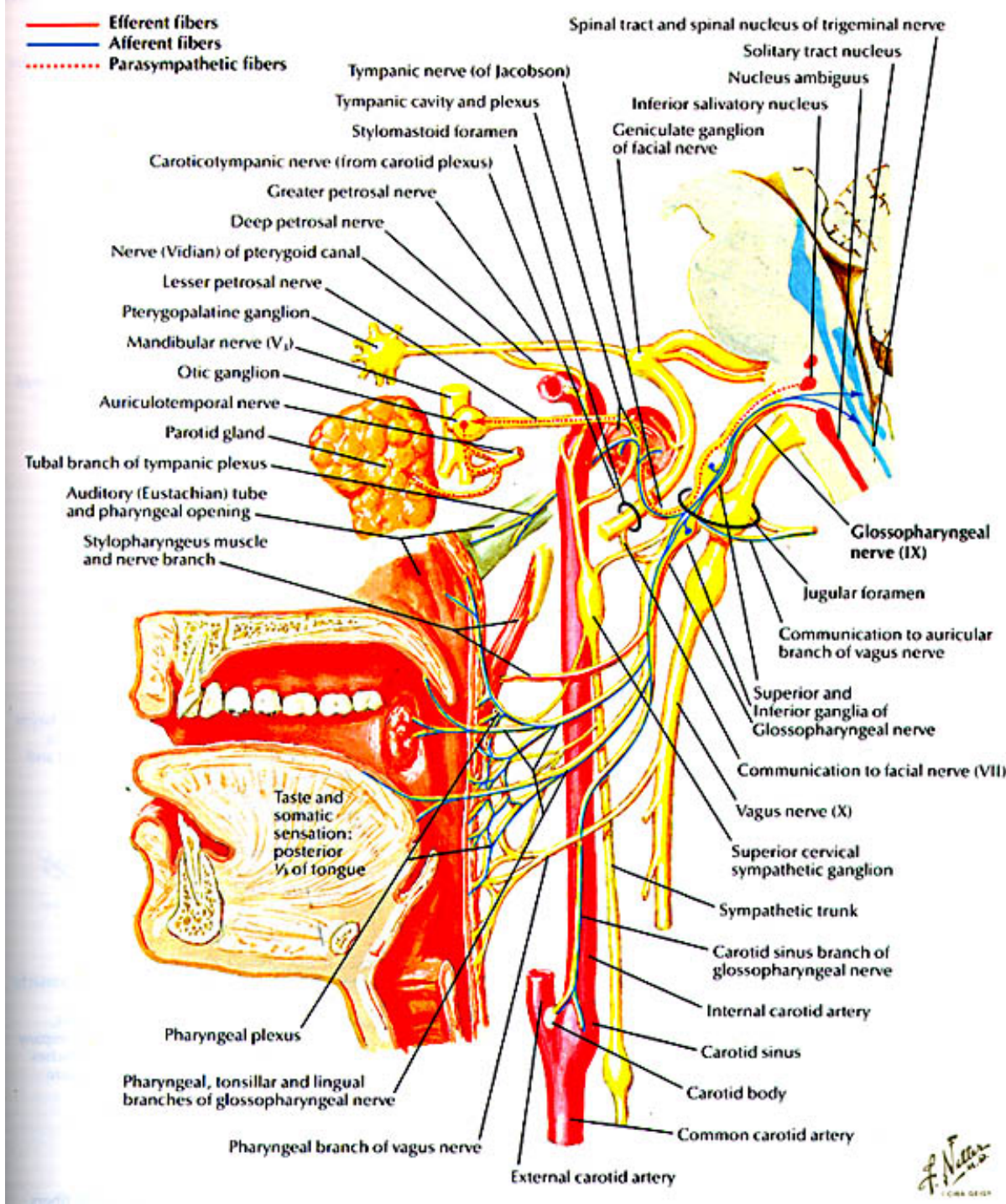


Clinical correlation

- The general sensory fibers of CN IX mediate the afferent limb of the pharyngeal reflex in which touching the back of the pharynx stimulates the patient to gag (i.e. the **gag reflex**).
- The efferent signal to the musculature of the pharynx is carried by the branchial motor fibers of the vagus nerve.

Special Sensory Component

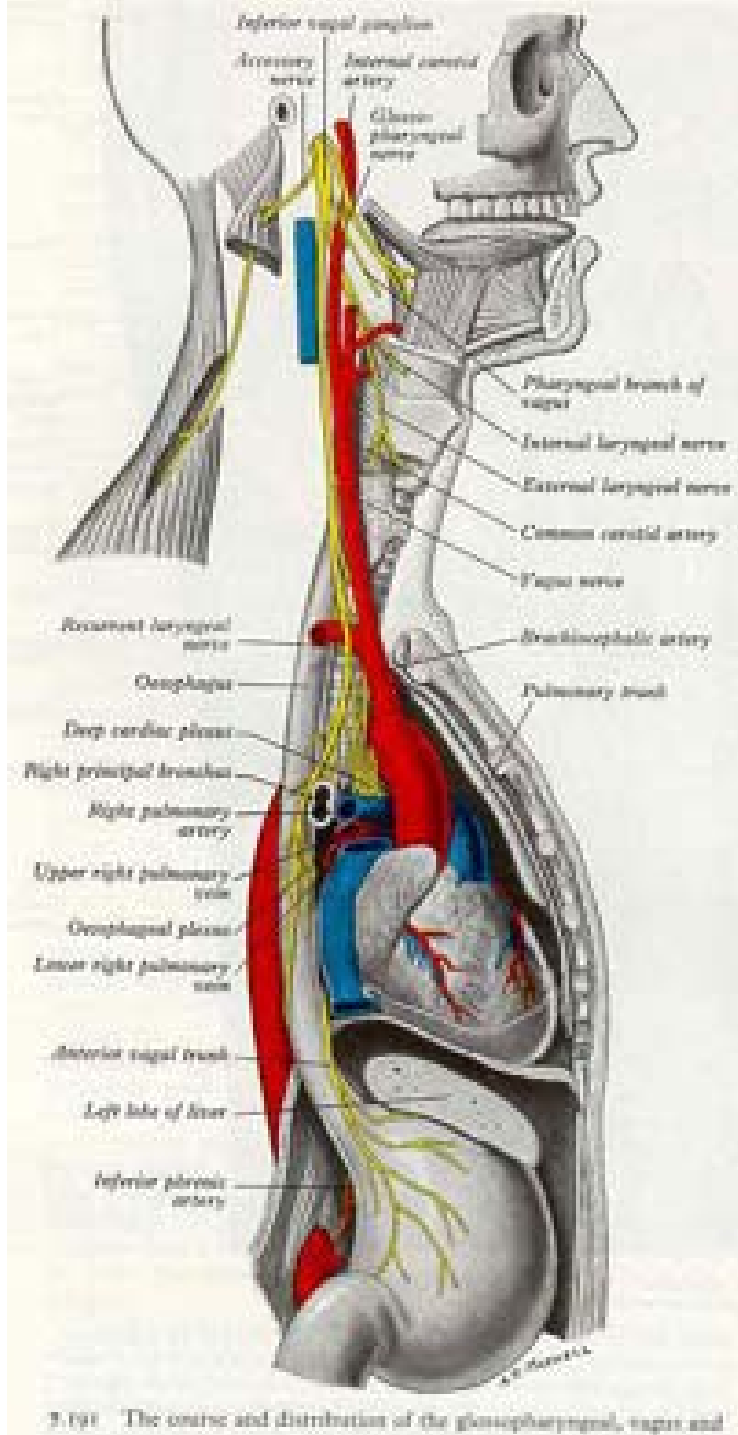
- provides taste sensation from the posterior one-third of the tongue.



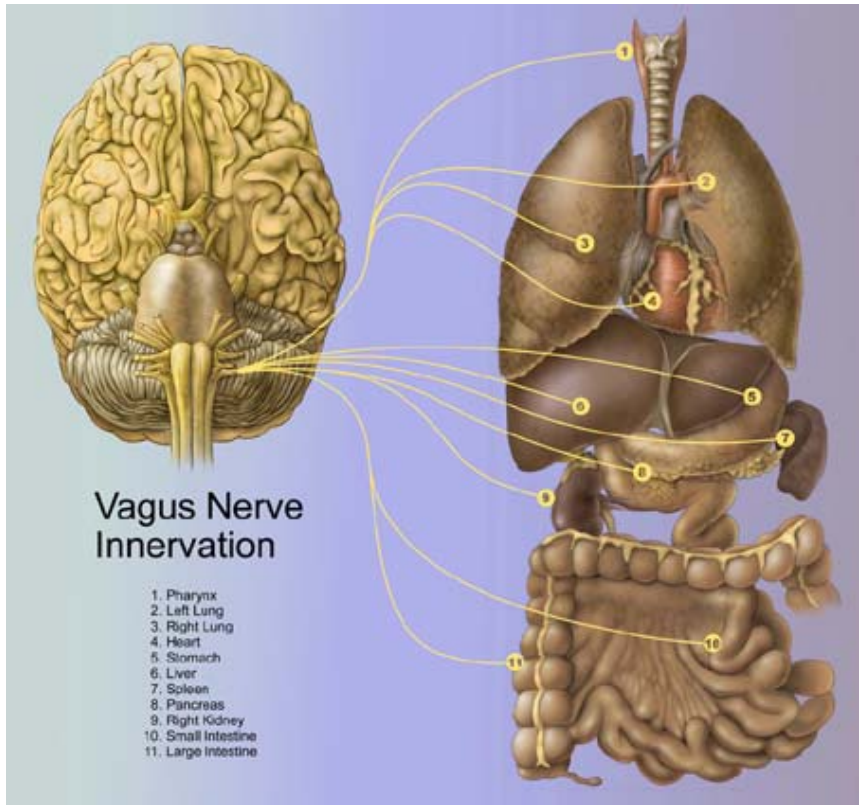
Vagus Nerve (CN X)

- is a mixed nerve, containing approximately 80% sensory fibers.
- It supplies the organs of voice and respiration with both motor and sensory fibres and
- the pharynx, oesophagus, stomach and heart with motor fibres.
- It is the most extensive cranial nerve, consisting of many branches.

- The nerve runs from the lower brainstem through the base of the skull to travel in the neck with the carotid artery and jugular vein.
- It then penetrates the chest to travel to the heart and lungs.
- It continues on to the abdomen where it breaks into a network of nerves to the abdominal organs.



- Supplies motor and sensory parasympathetic fibres to pretty much everything from the **neck** down to the first third of the transverse colon.
- it is involved in, amongst other things, such as **heart rate** gastrointestinal **peristalsis, sweating, and speech** (via the recurrent laryngeal nerve) and also the controls a few **skeletal muscle**
  of the pharynx and larynx:
  - levator veli palatini muscle
  - salpingopharyngeus muscle
  - stylopharyngeus muscle
  - palatoglossus muscle
  - palatopharyngeus muscle
  - superior, middle and inferior pharyngeal constrictors



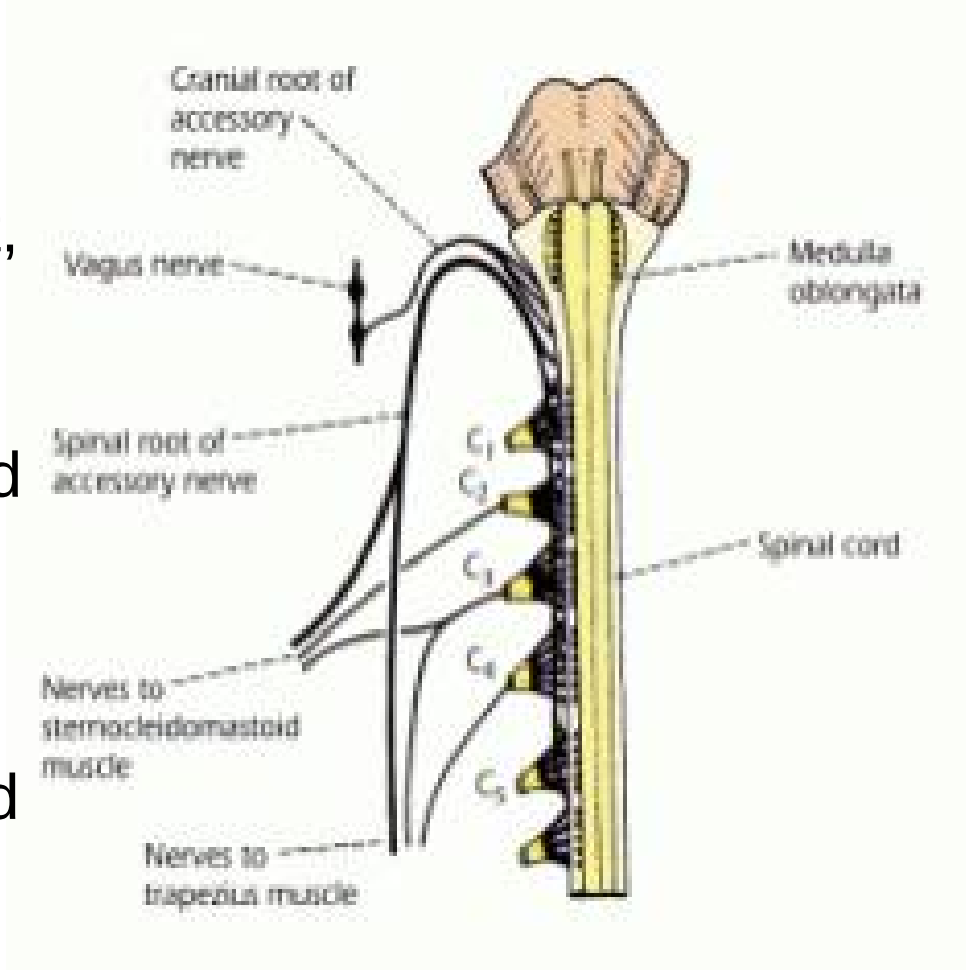
Accessory Nerve (CN XI)

(CN XI)

- innervates the soft palate, pharynx, larynx, sternocleidomastoid and trapezius muscles in the neck (see Figure 11.01).
- The sternocleidomastoid muscle turns the head and the trapezius muscle braces the shoulder and rotates the scapula during elevation of the upper limbs.

(CN XI)

- There are two distinct parts of the accessory nerve, the cranial root and the spinal root,
- cranial part joining the vagus nerve to innervate the larynx, some parts of the pharynx and the soft palate and
- the spinal root descend and runs laterally in the neck to supply the sternocleidomastoid muscle and the trapezius muscle.



(CN XI)

- CN X &XI can be assessed together by testing the gag reflex, palatal movement and sensation.
  - Touching the pharynx with an orange stick tests pharyngeal sensation (9th nerve) and the gag reflex (9th and 10th nerve). On phonation the soft palate should rise symmetrically in the midline (10th nerve).

- CN XI can be tested by assessing the power of the sternocleidomastoid and the trapezius muscles i.e. turning the head and shrugging the shoulders.

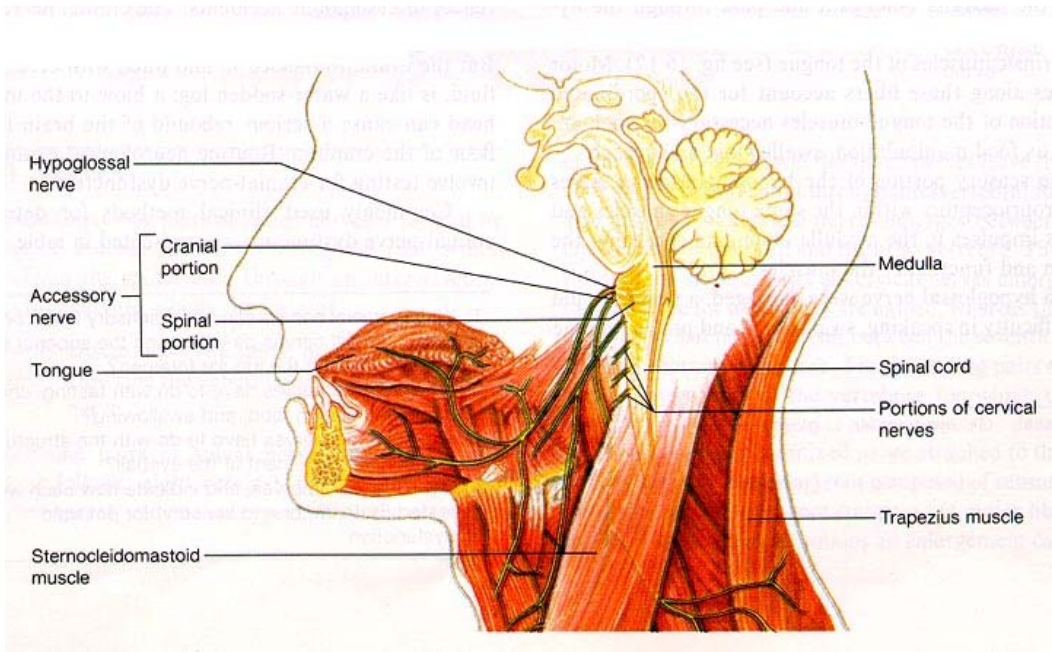
Testing CN XI

- Press down firmly on each shoulder and ask the patient to shrug against this resistance

- Holding the patient's head, ask the patient to turn their head whilst you try and resist their movement. Watch and palpate the sternomastoid muscle on the opposite side

Hypoglossal Nerve (CN XII)

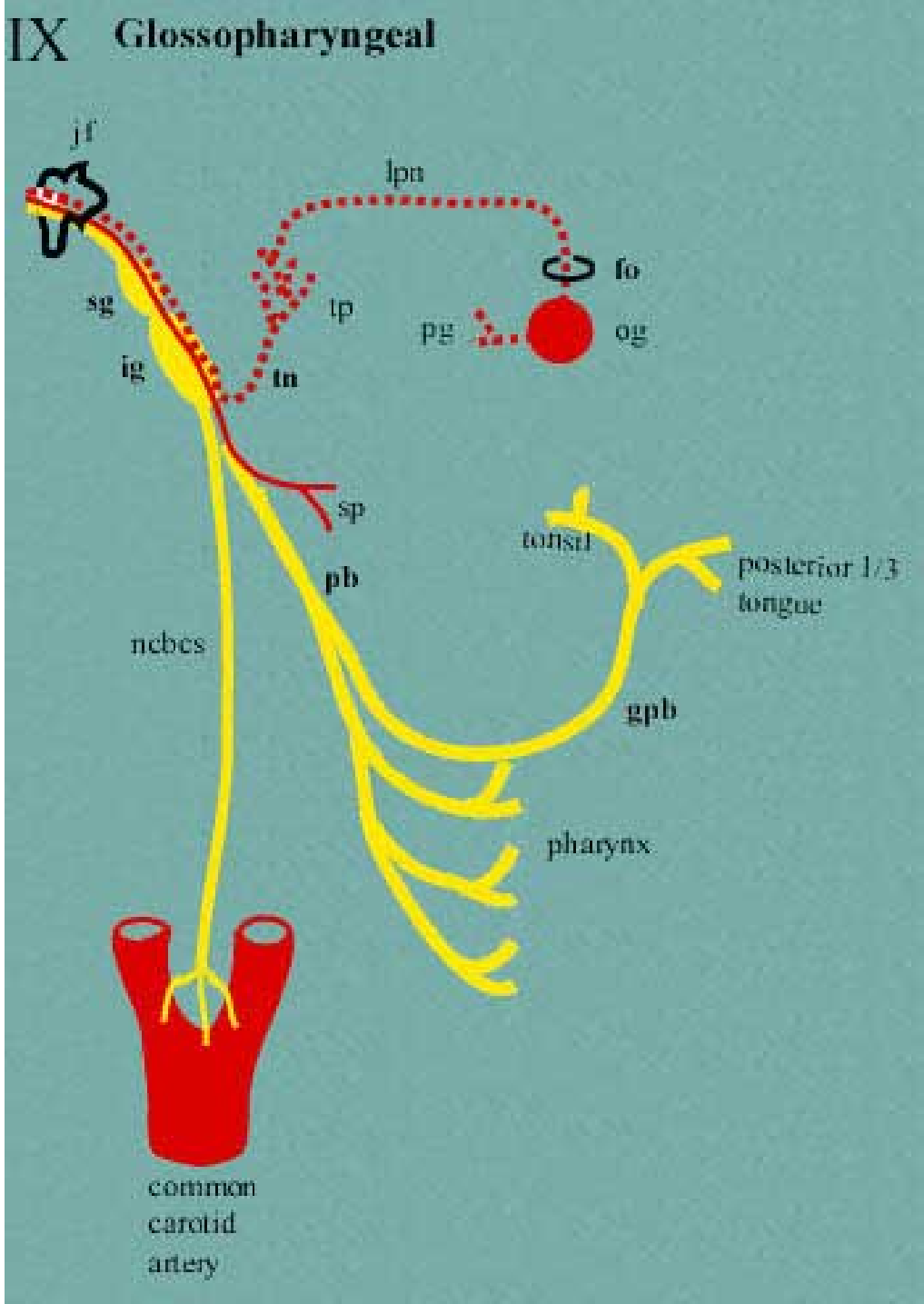
- Is a mixed nerve.
- The motor fibres arise from the Hypoglossal nucleus of the medulla oblangata
- innervate both the extrinsic and intrinsic muscles of the tongue.
  - fibres are distributed to the hypoglossus, styloglossus, geniohyoid and genioglossus muscles and all the intrinsic muscles of the tongue
  - The intrinsic muscles of the tongue alter the shape of the tongue, while the extrinsic muscles alter its shape and position.
  - The genioglossus muscle protrudes the tongue.
- The sensory root arises from proprioceptors within these same muscles.



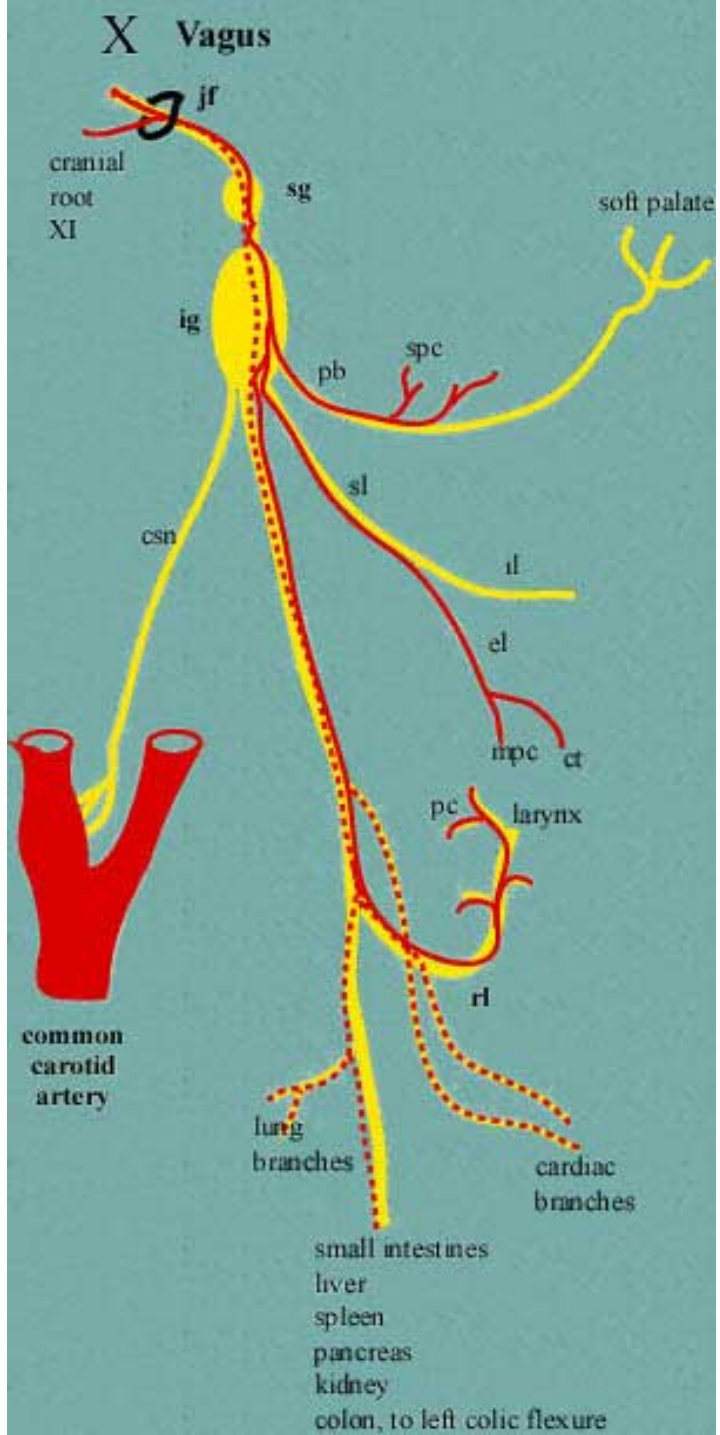
Examination of the Hypoglossal Nerve

- Trauma to the Hypoglossal nerve would result in difficulty speaking, swallowing, and protruding the tongue.
- Ask the patient to stick out their tongue and to move it from side to side. The tongue will normally protrude from the month and remain midline. Note any deviations of the tongue from the midline.
- Listen to the articulation of the patient's words.

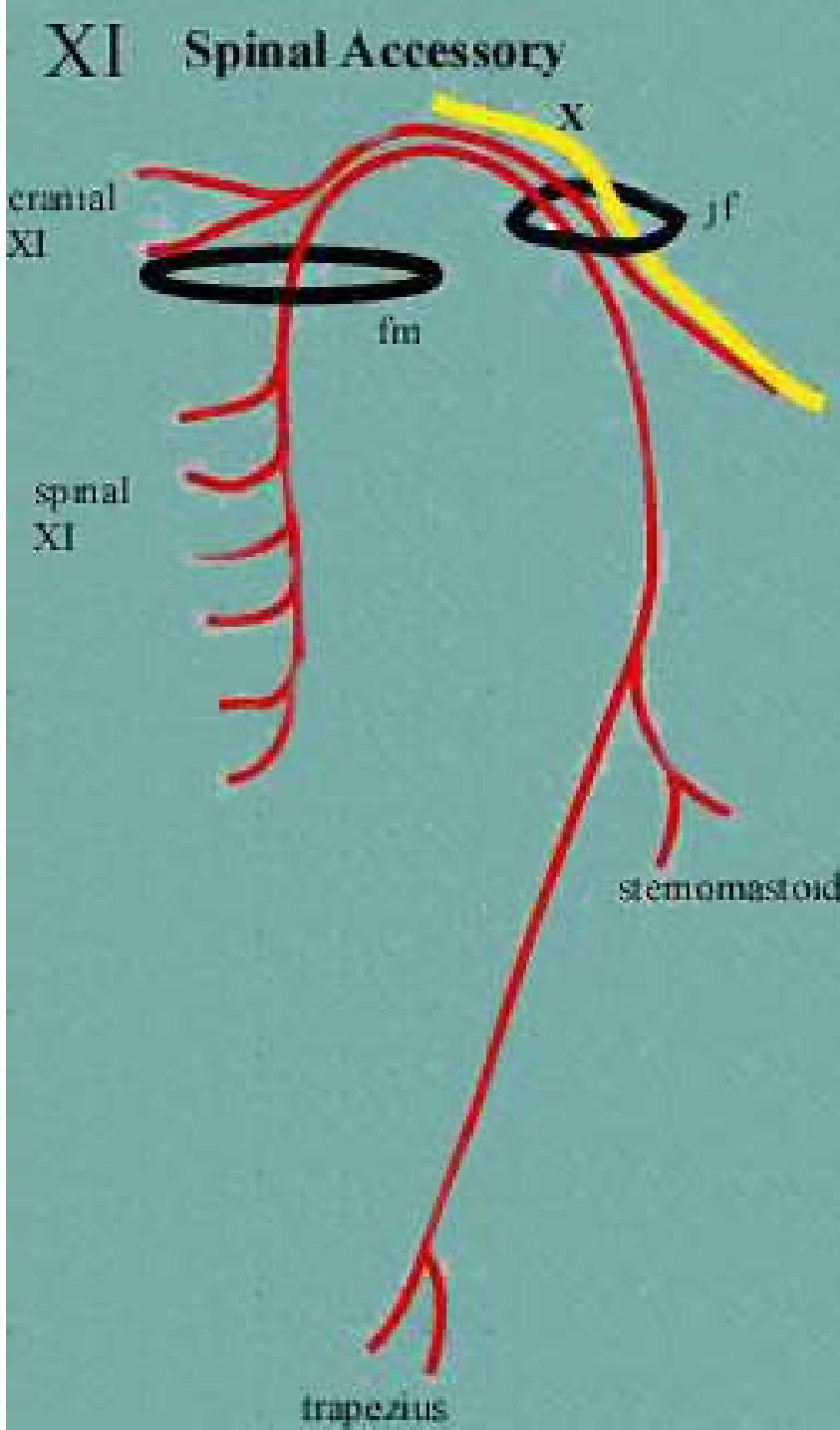
jf--jugular foramen
sg--superior ganglion
ig--inferior ganglion
tp--tympanic plexus
lpn--lesser petrosal nerve
fo--foramen ovale
og--otic ganglion
pg--parotid gland
sp--nerve to stylopharyngeus muscle
pb--pharyngeal branch
ncbcs--nerve to carotid body
carotid sinus

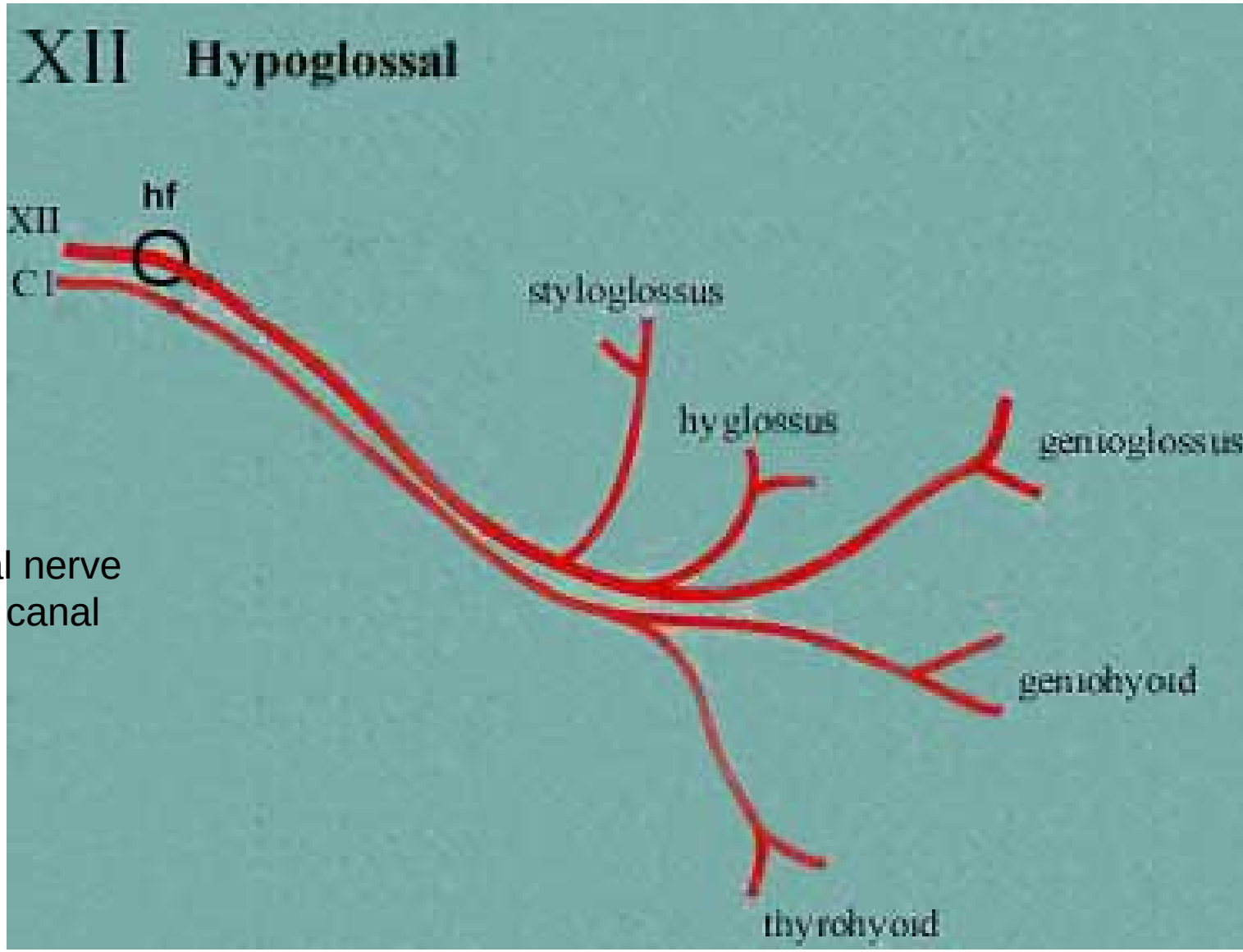


jf--jugular foramen
sg--superior ganglion
ig--inferior ganglion
pb--pharyngeal branch
spc--superior pharyngeal constrictor
sl--superior laryngeal nerve
il--internal laryngeal
el--external laryngeal
ct--cricothyroid muscle
mpc--middle pharyngeal constrictor
rl--recurrent laryngeal nerve
pc--pharyngeal constrictors
csn--carotid sinus nerve



fm--foramen magnum
jf--jugular foramen





C1--first cervical nerve
hf--hypoglossal canal